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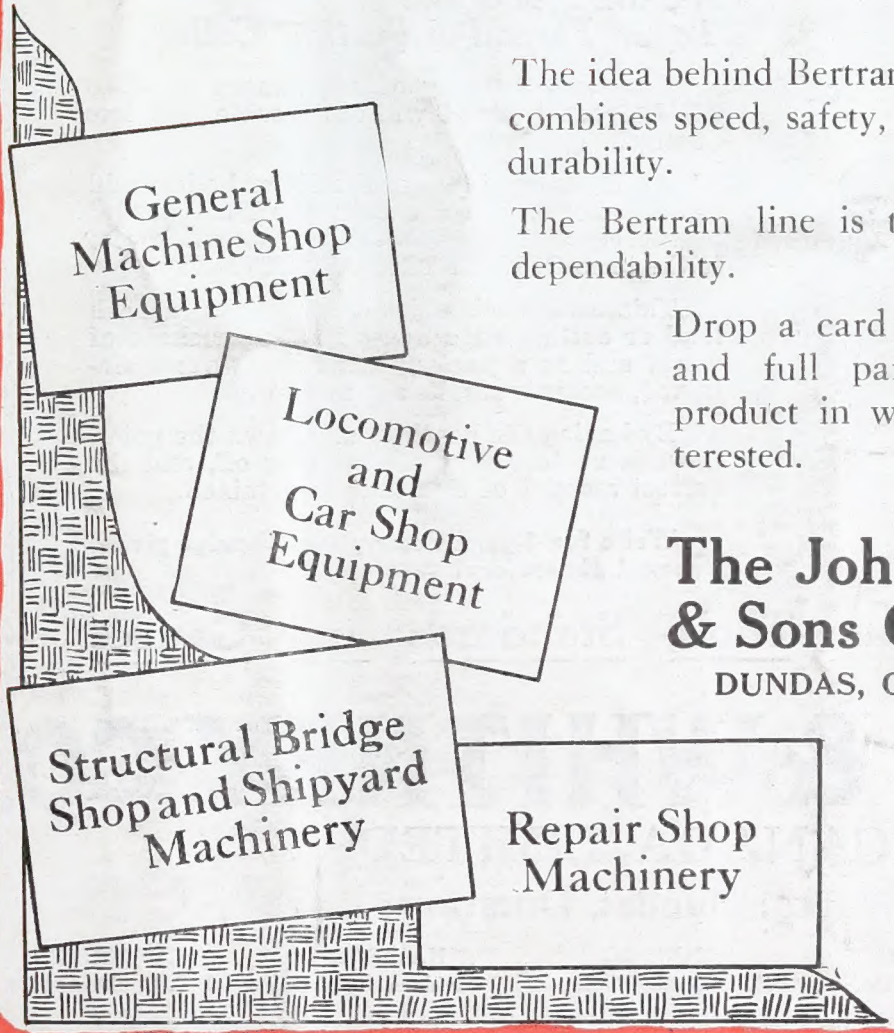
CANADIAN MACHINERY AND MANUFACTURING NEWS

A weekly newspaper covering in a practical manner the mechanical power, foundry and allied fields.
Published by the MacLean Publishing Company, Limited, Toronto, Canada

Vol. XXII., No. 9. Publication Office: Toronto, August 28, 1919. Subscription Price $3.00 per year.

BERTRAM MACHINE TOOLS


General Machine Shop Equipment
Locomotive and Car Shop Equipment
Structural Bridge Shop and Shipyard Machinery
Repair Shop Machinery

The idea behind Bertram Machine Tools combines speed, safety, convenience and durability.

The Bertram line is the last word in dependability.

Drop a card for photographs and full particulars of any product in which you are interested.

The John Bertram & Sons Co., Limited
DUNDAS, ONT., CANADA

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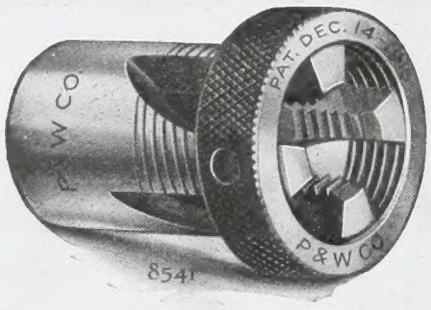
SMALL TOOLS

Taper Thread Adjusting Collar

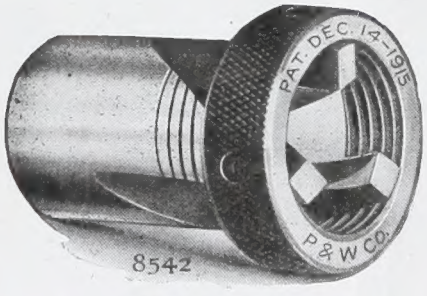
Insures Uniform Concentric Adjustment

P. & W.

Spring Screw Dies and Hollow Mills



Spring Screw Die



Hollow Mill

Advantages of the Taper Thread Adjusting Collar

Ease and delicacy of adjustment to FINE LIMITS are secured without trouble and loss of time.

All lands or prongs of the die or hollow mill are adjusted in or out exactly the same amount by merely turning the collar, thus giving rise to the term CONCENTRIC ADJUSTMENT.

This concentric adjustment results in each land or cutting edge doing its proper share of work, and as a perfect circle is always maintained, accurate results are assured.

By having the bearings always on the point, there is no tearing while backing off, and the correct amount of clearance is obtained.

Write for 4-page descriptive Circular giving size and dimensions.

Precision Machine Tools, Standards and Gauges

PRATT & WHITNEY CO.

OF CANADA, LIMITED

Works: Dundas, Ontario

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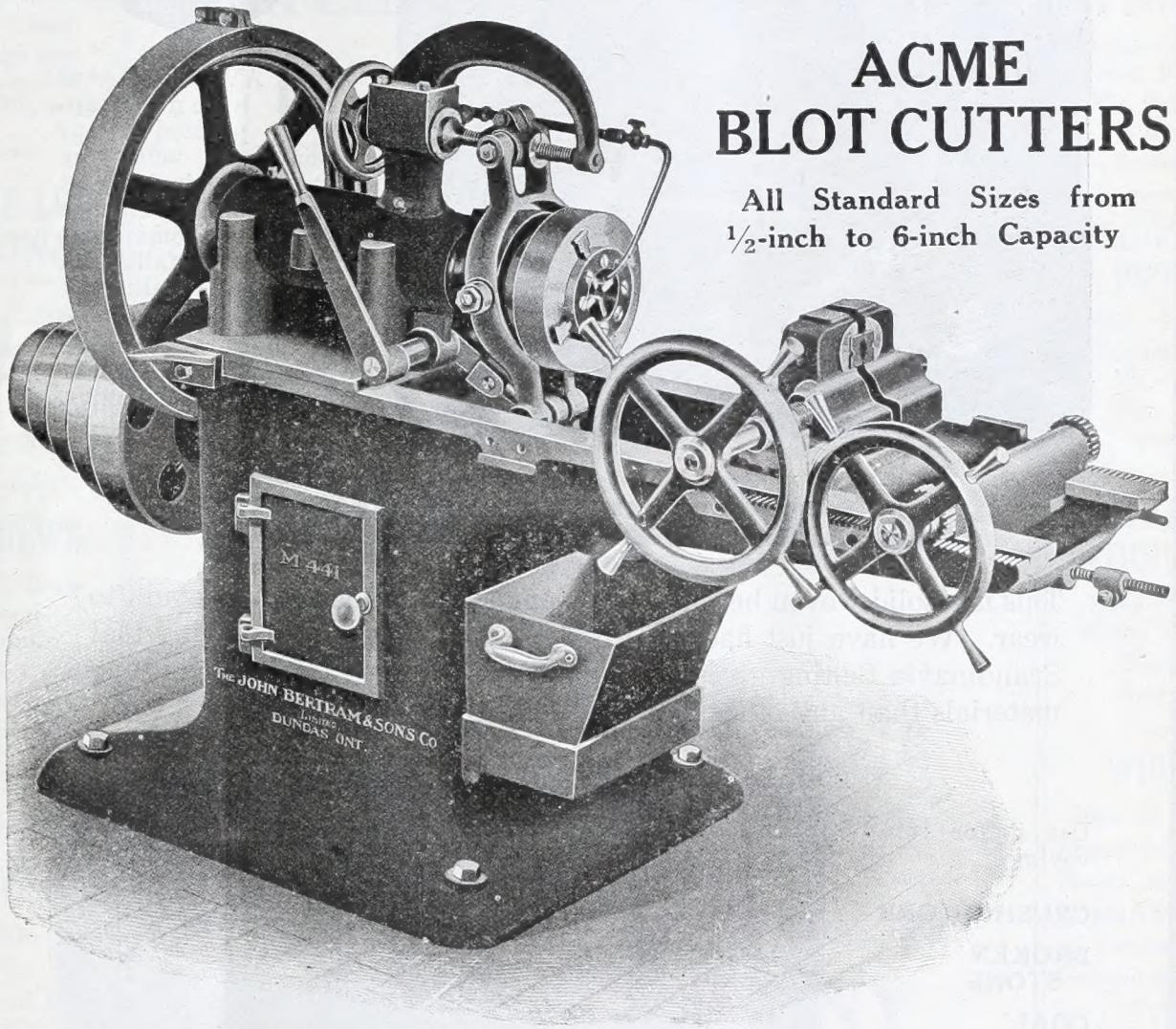
BERTRAM MACHINE TOOLS

ACME BLOT CUTTERS

All Standard Sizes from
½-inch to 6-inch Capacity



Supplied with Leadscrew Attachment for Stay Bolts or other work Requiring Special Accuracy or Pitch.

WRITE US FOR FULL DETAILS OF ANY MACHINE
OR MACHINES IN WHICH YOU ARE INTERESTED

The John Bertram & Sons Co., Limited

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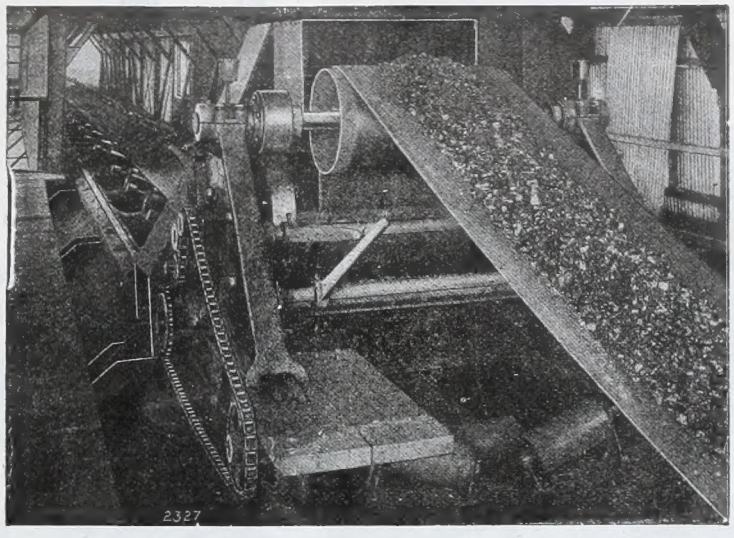
HALIFAX, Davidson Bldg.

Canadian Machinery and Manufacturing News, August 28th, 1919. Vol. 22, No. 9. Published weekly at 143-153 University Ave., Toronto, Canada. Subscription price in Canada, $3.00; United States, $3.50. Entered as second-class matter at the Post Office Department, Ottawa, Canada. Entered as second-class matter July 1, 1912, at the Post Office at Buffalo, under the Act of March 3rd, 1879.

BELTING



SCANDINAVIA BELTING

HAVE you ever been disappointed in your conveyor belts by their opening up at the plies? This is one of the commonest reasons for failure in a conveyor belt.

Is there a remedy? YES. Buy a belt that is not built up in plies. Such a belt is

Scandinavia Belting

This is a solid woven belt, made of long stock cotton, and it is built to wear. We have just had reports from two large users saying that Scandinavia Belting gives them more dollars in value for handling materials than any other belt they had ever used.

Use it for conveying

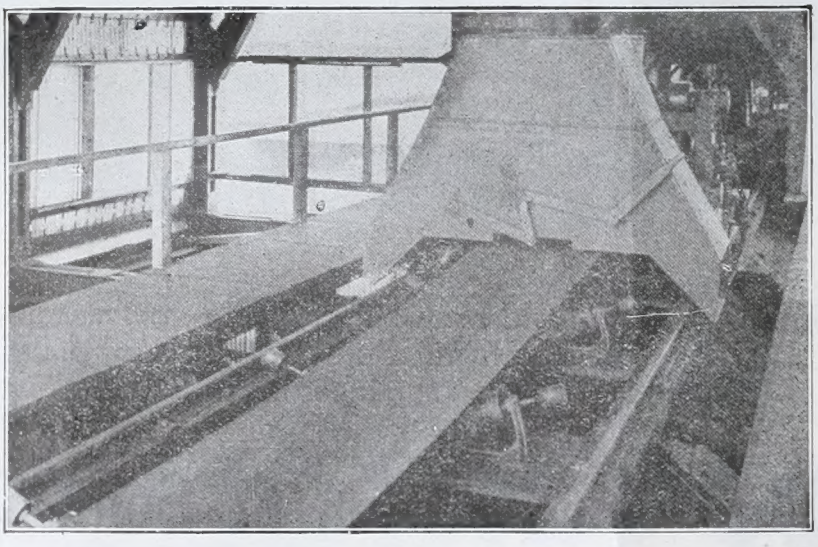
CRUSHED ORE

BROKEN STONE

COAL

QUENCHED COKE, Etc.

We want your business and solicit your inquiries.



FEDERAL ENGINEERING CO., LIMITED

172 John St., Toronto

BY-PRODUCT COKE
SULPHATE of AMMONIA

"HAMILTON" PIG IRON
Basic Malleable Foundry

STEEL & IRON BARS
OPEN HEARTH STEEL SHEETS

FORGINGS
Car Axles
Shape and Drop Forgings
Carriage and Automobile Hardware

POLE LINE HARDWARE
(Black and Galvanized)
Pole Steps
Cross Arm Braces
Guy Clamps
Guy Rods

SCREWS
Steel, Brass and Bronze
Wood and Machine Screws

NAILS, SPIKES & RIVETS
Wire
Cut
Boat and Horse Shoe Nails
Railway
Pressed and Drift Spikes
Tacks
Shoe Nails
Steel and Copper Rivets
Burrs

Purchase the Products of Canadian Mills

TO uphold the Glory we have jointly earned—to honor our noble dead—to comfort the wounded, and extend to the men returned the hand of prosperous welcome, we must cast aside all forebodings and face the future with unbounded courage and confidence and, without a shadow of doubt, declare to the World that this Nation, which was so quickly and successfully transformed to a War basis, can be depended upon to revert to Peace conditions with equal success. The buyer and seller must recognize their duty to the Nation and co-operate fully to the end that all products that can be produced in Canada by Canadian workmen shall not be purchased elsewhere.

OUR Duty is plain; Canada with Canadian labor and capital can produce, manufacture and distribute products sufficient to keep the wheels of industry turning to the limit. The song of Prosperity and Happiness should ring out all over the land. Let us sincerely pledge to the extent of our needs, to purchase materials produced in Canada by Canadian Workmen, and the result of our efforts will return to us the Blessings of a Prosperous and Happy Nation.

THE STEEL COMPANY OF CANADA
LIMITED
HAMILTON MONTREAL

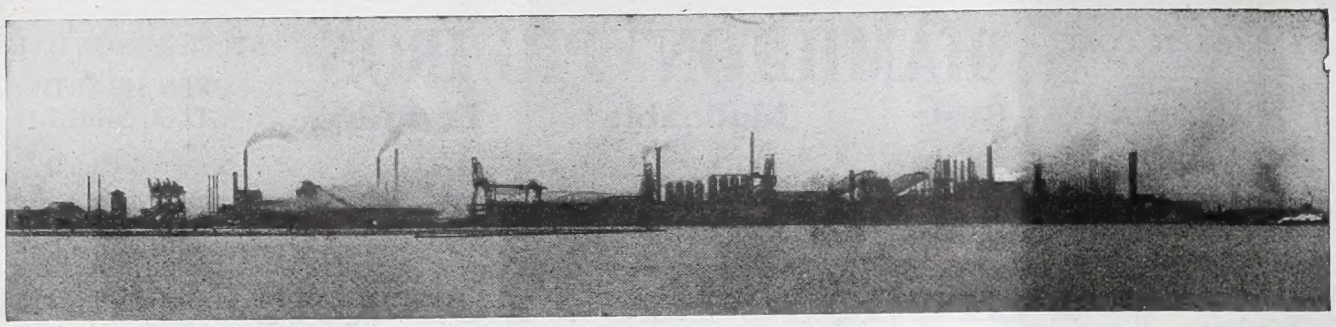
RAILROAD TRACK MATERIAL
Angle Bars
Track Bolts
Tie Plates
Tie Rods
Spikes

WROUGHT PIPE
Black Pipe
Galvanized Pipe
Nipples
Couplings

LEAD PRODUCTS
Lead Pipe
White Lead
Shot
Putty

WIRE
Steel & Brass
Copper & Bronze
Heavy and Fine
Bright Annealed
Coppered
Galvanized and Tinned
Stranded
Steel and Copper Cable
Clothes Line
Staples
Barb Wire
Woven Wire Fencing
Fence Gates

Bars
Blooms
Billets
Wire
Wire Rods
Sheets
Horse Shoes
Angles
Channels
Plow Beams



General View of the Plant of the Algoma Steel Corporation from the Waterfront.

ANNOUNCEMENT

THE ALGOMA STEEL CORPORATION, LIMITED, take pleasure in announcing to their customers and the Canadian trade that in accordance with the widespread desire throughout the Dominion that there should be obtained in Canada with Canadian labor, a much larger proportion of the requirements of this country in STEEL SECTIONS for STRUCTURAL PURPOSES, CAR CONSTRUCTION, SHIPBUILDERS' REQUIREMENTS, etc., they are just completing extensive alterations and additions to their rolling mills, and on or about 1ST NOVEMBER, will be ready to produce and ship American Standard Sections of BEAMS and CHANNELS up to and including 15″, all standard sections of ANGLES from 6″ x 6″ down to 1¼″ x 1¼″, ZEE BARS for car builders and general purposes, small and large ROUNDS and SQUARES, and FLAT BARS up to 14″ wide. The quality of the product is already well known to the trade, and is exclusively steel made by the Open Hearth process. and can be furnished in all grades from the softest rivet stock to high carbon special spring material. Motto: "Quality and Service."

MARK OF ALGOMA O.H. QUALITY

The following are the sections which will be rolled:—

ANGLES—Equal Leg—
6 x 6″—5 x 5″—4 x 4″
3½ x 3½″—3 x 3″
2½ x 2½″—2¼ x 2¼″
2 x 2″—1¾ x 1¾″
1½ x 1½″—1¼ x 1¼″

ANGLES—Unequal Leg—
6 x 4″—6 x 3½″—5 x 4″
5 x 3½″—5 x 3″—4½ x 3″
4 x 3½″—4 x 3″—3½ x 3″
3½ x 2½″—3 x 2½″—3 x 2″
2½ x 2″

BEAMS—
15″, 12″, 10″, 8″, 6″, 5″, 4″, 3″.

CHANNELS—
15″, 13″, 12″, 10″, 8″, 6″, 5″, 4″, 3″.

ZEES—
3¼ x 5 x 3¼ x 5 x 5/16″
3 5/16 x 5 1/16 x 3 5/16 x ⅜″
3⅜ x 5⅛ x 3¾ x 7/16″
3 1/16 x 4 x 3 1/16 x ¼″
3⅛ x 4 1/16 x 3⅛ x 5/16″
3 3/16 x 4⅛ x 3 3/16 x ⅜″
2 11/16 x 3 x 2 11/16 x ¼″
2¾ x 3 1/16 x 2¾ x 5/16″

ROUNDS—
All sizes from ½″ up to and including 4″.

SQUARES—
All sizes from ½″ up to and including 3″.

FLATS—
All sizes from 1 x ¼″ up to and including 14″ wide.

MINE RAILS—
All sections from 12 lbs. up to and including 45 lbs. per yard.

PIG IRON—
Machine Cast Foundry, Maleable and Basic.
Sulphate of Ammonia.

NITRE CAKE.

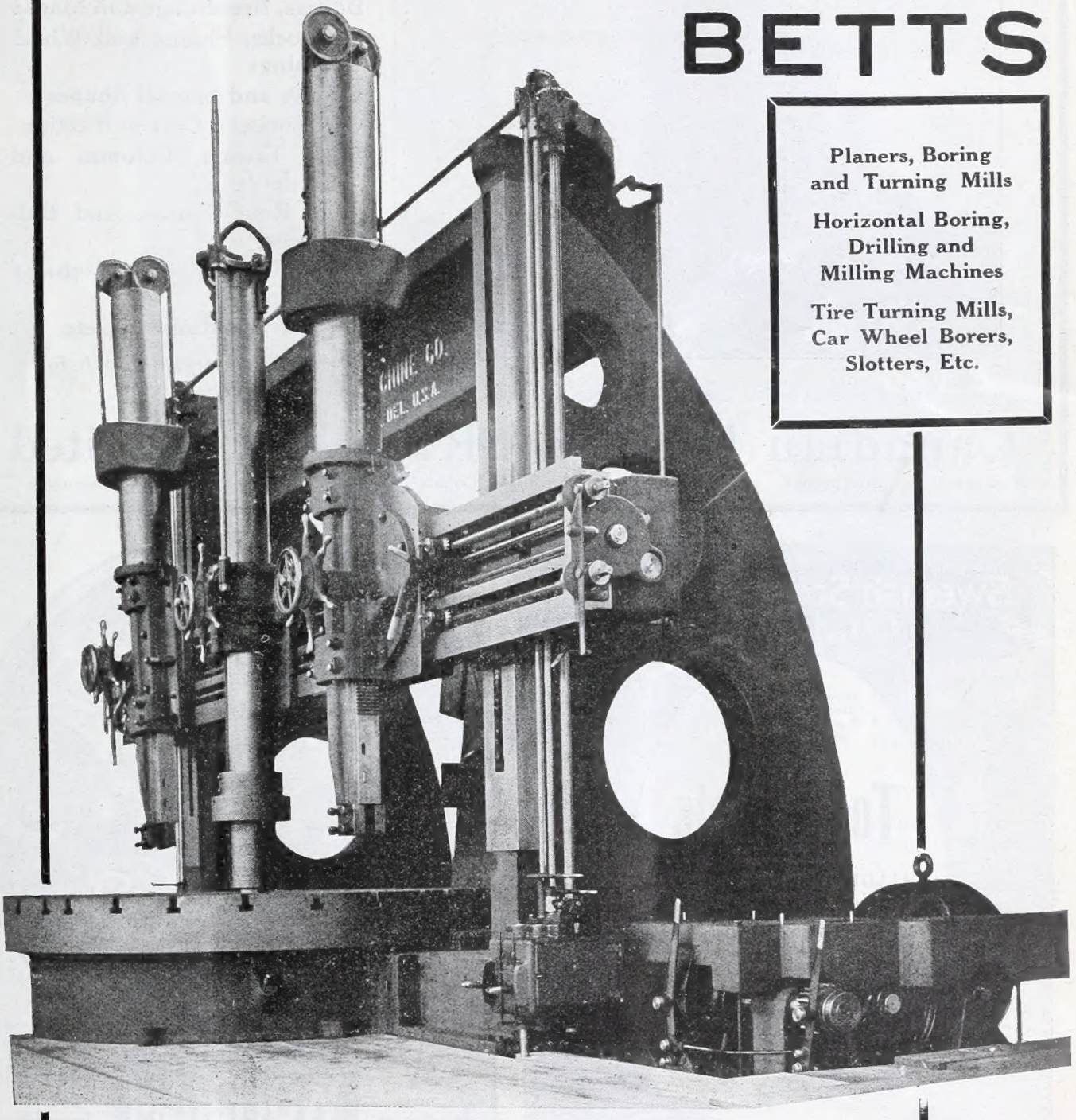
For the better convenience of customers who may find it necessary to secure rush shipments of particular items, they contemplate keeping a large stock of all the various standard sections constantly on hand, and to this end extensive warehouse facilities are being prepared.
Your enquiries and business will be appreciated.

ALGOMA STEEL CORPORATION

SAULT STE. MARIE, ONTARIO

"Machine Tools That Produce—"

BETTS



Planers, Boring and Turning Mills

Horizontal Boring, Drilling and Milling Machines

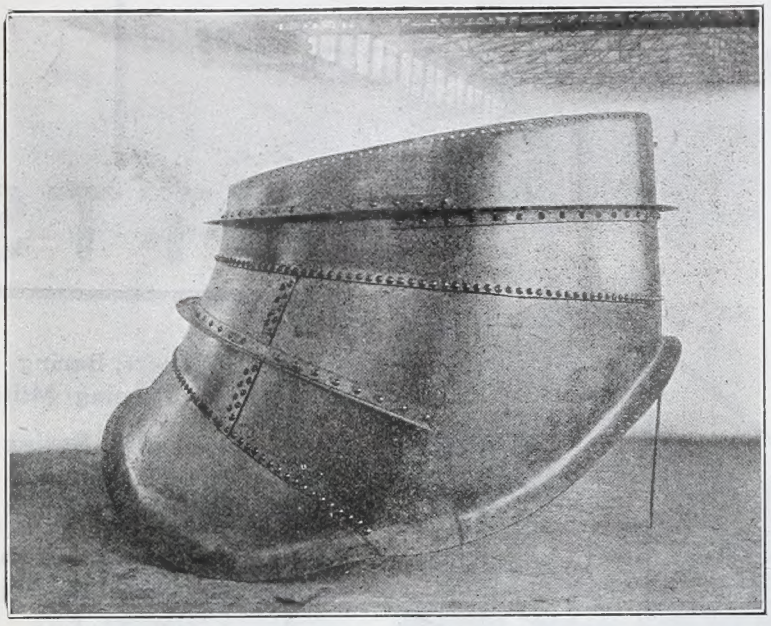
Tire Turning Mills, Car Wheel Borers, Slotters, Etc.

HEAVY BETTS DUTY

BETTS MACHINE CO.

408 BLOSSOM ROAD ROCHESTER, N.Y.

STEEL PLATE AND STRUCTURAL STEEL WORKS



A small part of a 14-foot penstock recently built for the Canadian Light and Power Company. This is the third contract executed by our Jenckes Plant for this concern.

We are prepared to make prompt delivery of:

Air Receivers and Tanks of all kinds
Boilers, Breechings and Stacks
Penstocks, Flumes and Wheel Casings
Elbows and Special Shapes
Ore Buckets, Cars and Skips
Steel Towers, Columns and Girders
Steel Roof Trusses and Balconies
Steel Railway and Highway Bridges
Steel Crane Runways, etc.

Ask our nearest branch for estimates.

Canadian Ingersoll-Rand Co., Limited

Sydney Sherbrooke Montreal Toronto Cobalt Winnipeg Nelson Vancouver

Swedish Steel & Importing Co., Limited

Montreal New York Toronto Denver

Direct representatives of foremost Swedish mills; makers of

Tool Steels

ALLOY STEELS, BILLETS, BARS, DISCS, SHEETS, HIGH SPEED STEELS, DRILL RODS, DRAWN BARS, SEAMLESS TUBING, COLD ROLLED STRIP STEEL, WELDING WIRE, WROUGHT AND ROLLED IRON, PIG IRON, STEEL AND IRON ENDS, HOLLOW AND SOLID MINING DRILL STEEL.

TRADE MARK SS "DOUBLE ESS"

PROMPT SHIPMENTS from large stock

WOLFRAM

MADE IN THE U.S.A.

HIGH SPEED STEEL TRADE MARK

A Keen Cutter

WOLFRAM *Is Both*

Strong in the Neck

VULCAN CRUCIBLE STEEL CO. Aliquippa ESTABLISHED 1900 Pa: U.S.A.

Represented in Canada by Messrs Norton Callard & Company MONTREAL QUE.

Illustration shows a Wilt Twist Drill in active service at the new shops of the Canadian National Railway, Leaside, Ontario.

Wilt Quality improves production and cuts drilling costs to a minimum.

This is no theory, no untested statement, but an established fact backed by many of the largest manufacturers throughout Canada. For steady, reliable output of work that is satisfactory from the standpoint both of quantity and quality there is no better choice than WILT products.

"Where there's a WILT There's the Way"

WILT TWIST DRILL COMPANY

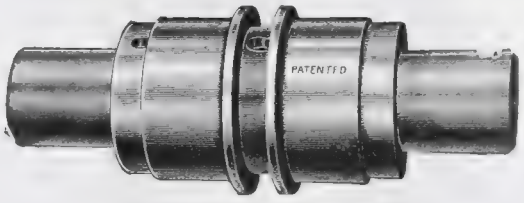
OF CANADA, LTD. WALKERVILLE, ONT.

London Office: Wilt Twist Drill, Agency, Moorgate Hall, Finsbury Pavement, London, E.C. 2, England.

Manufacturers of a paramount line of Twist Drills, Reamers and Milling Cutters

THE JOHNSON FRICTION CLUTCH

The Clutch of a Thousand Uses



Double Clutch—Exterior

THE JOHNSON FRICTION CLUTCH

Every day we are called upon to do something new with Johnson clutches. The demand for a practical friction drive spreads over an unlimited field. And the "Johnson" is the one clutch that can always answer. No matter how strenuous or how delicate the service, no matter how difficult the situation—we have the clutch that will handle it. Get acquainted with an all-round clutch.

WRITE TODAY FOR OUR YELLOW DATA SHEETS

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THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN.

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ELECTRIC
Steel Castings

High Grade STEEL Castings
Of Every Description

Prompt Deliveries

Send us your drawings
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Annealed—Heat Treated

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Rough Turned—Annealed—Heat Treated

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General Steel Company
Milwaukee, Wisconsin
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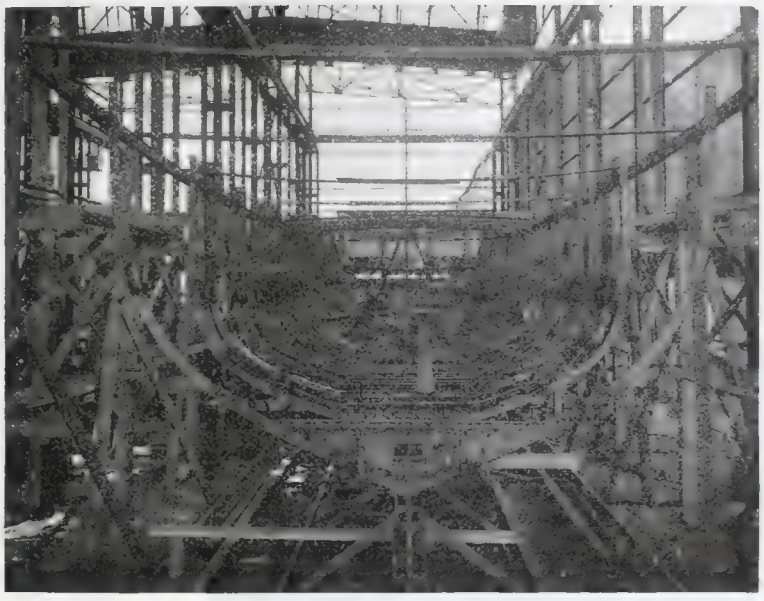

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IN STEEL

STERN and RUDDER FRAMES,
SHAFT BRACKETS, ANCHORS,
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LIMITED

Transportation Building, Montreal

Electrite

Electric furnaces, automatically regulated, the most modern methods, and the introduction of Uranium — make this a steel of truly remarkable cutting properties.
We know "Electrite" cannot be bettered — and stand ready to prove it to you.

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ELECTRIC STEEL CO.
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High Speed Steel

Uranium

STEEL STAMPS

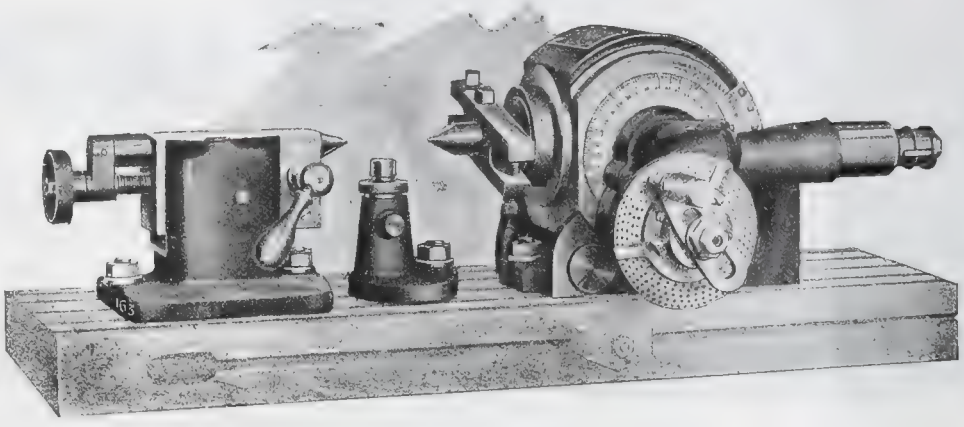
FOR MARKING ALL CLASSES OF METAL WORK

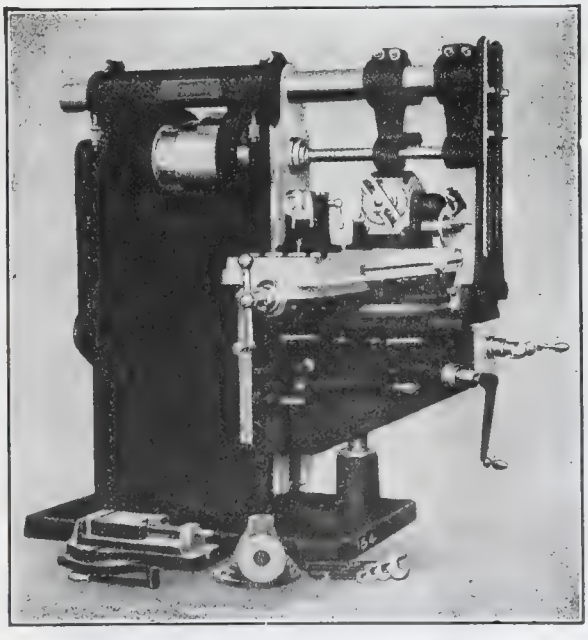
We will Give You Satisfaction on all Work of this Kind.

Send for Prices

PRITCHARD-ANDREWS CO.
OF OTTAWA
General Engravers and Die Sinkers
264 SPARKS ST. OTTAWA, CAN.

The Dividing Head





FORD-SMITH MILLERS

The Miller of high-grade construction—fast, accurate and durable.

The care used in the building of Ford-Smith Dividing Heads is a fair gage of the workmanship in the entire machine. Each Head is thoroughly tested for accuracy so that every finished Head comes within the closest practice limits, giving satisfactory results.

Manufactured in Canada by

THE FORD-SMITH MACHINE CO., LIMITED

HAMILTON -- CANADA

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Gollin & Co., MELBOURNE, AUSTRALIA

STEEL *for*

Every Commercial Purpose

We are the only company in Canada producing steel ingots by the "HARMET" Liquid Process, a process that makes these ingots vastly superior to the ordinary kind, improving the physical properties and reducing the waste of ingot.

We can supply forgings of all shapes and sizes made of ordinary or "HARMET" Fluid Compressed Open-Hearth Steel on the Shortest Notice.

Nova Scotia Steel and Coal Co., Limited

Head Offices:
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Western Sales Offices:
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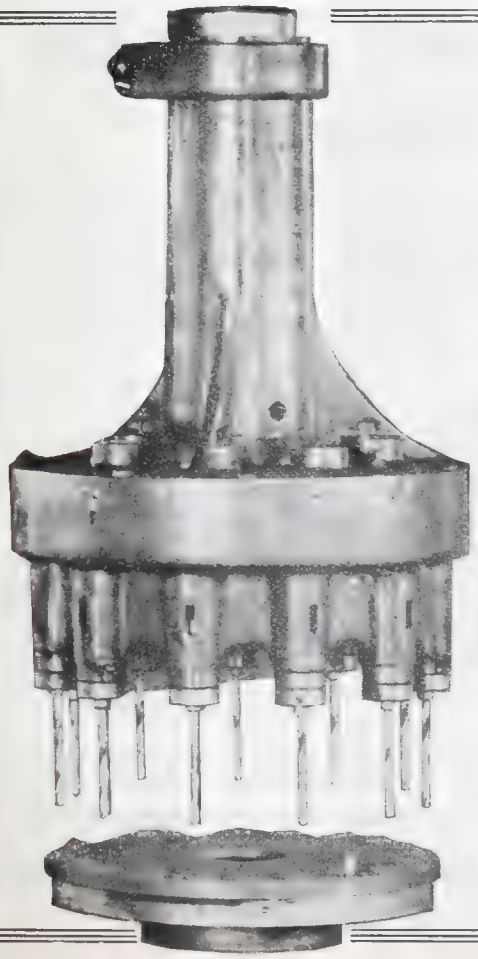
MONTREAL

Steel Ingots
by the
HARMET
Liquid Process



SPEED UP THE WORK

Rising costs are knocking the bottom out of profits these days! Materials and labor are up. No chance to reduce them. But you can speed up your work. The Hoefer Manufacturing Company has a proposition that will cut your drilling cost. Not guesswork, either, but on a basis proved by experience.

By using Hoefer Auxiliary Heads you can drill ten, twelve or more holes in the same time as one. Not only do you save the drilling time, but also the time lost shifting the jigs and raising and lowering the spindle for the extra holes.

360 manufacturers, 99 distinct lines of business—probably some of **your** competitors—employ Hoefer Auxiliary Heads to increase profits. They say the Hoefer Auxiliary Heads pay for themselves in 30 to 60 days.

Hoefer Auxiliary Heads are made in any multiple, arranged in any manner, from 2 up. Made by expert toolmakers and guaranteed to handle accurately the work for which they are designed.

Investigate now. Stop the leakage of dollars due to the use of single drills. Write for catalog and send blueprint of some of your work for estimate of time and cost.

The Hoefer Mfg. Co., Freeport, Ill.

621 Washington Blvd., Phone Haymarket 2408, Chicago, Illinois; 1113 Citizens' Bldg., Phone Main 795, Cleveland, Ohio; 708 Empire Bldg., Phone Court 1911 or 1912, Pittsburgh, Pa.; 602 Kerr Bldg., Phone Cherry 2884, Detroit, Mich.; 30 Church Street, Phone Cortland 1615, New York City; Badger-Packard Mchy. Co., Milwaukee, Wisconsin; National Supply Co., Toledo, Ohio.

The Canadian Fairbanks-Morse Company, Limited
"Canada's Departmental House for Mechanical Goods"
Halifax St. John Quebec Montreal Ottawa Toronto Hamilton Windsor Winnipeg Saskatoon Calgary Vancouver Victoria

HŒFER Auxiliary Heads

MEN whose souls have been tried in the Crucible of War Time Service will not easily forget those forces, either Human or Mechanical, which were instrumental in achieving Victory.

"Red Cut Superior"

The Nationally Known FIRST QUALITY

HIGH SPEED STEEL

Is a Fighter for Efficiency in Peace Times and War Times.

Are your Tools made of Red Cut?

VANADIUM-ALLOYS STEEL CO.

General Sales Offices, PITTSBURGH, PA.
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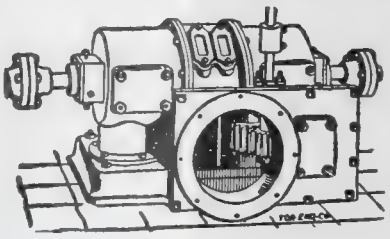
BOSTON
BUFFALO
CINCINNATI
CHICAGO
CLEVELAND
DETROIT
PITTSBURGH
MONTREAL
NEW YORK
TORONTO

WATER POWER DEVELOPMENT



Over forty years' experience in designing and installing special turbines, both on vertical and horizontal shafts.
Can supply complete equipment, including flume, turbine and power transmission.
Stock of standard vertical shaft Little Giant Turbines on hand for prompt shipment.

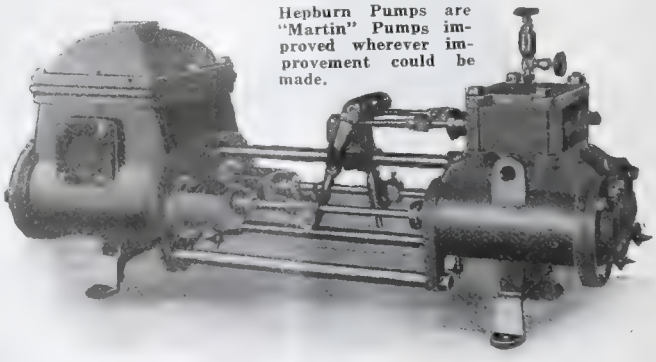
We solicit your inquiries.

THE J. C. WILSON MFG. CO.
LIMITED
BELLEVILLE, ONTARIO

Hepburn Pumping Machinery

Our line embraces standard duplex pumps for boiler feeding and for fire and general service; tank or low service duplex pumps; duplex hydraulic pumps for service in connection with hydraulic lifts and presses, accumulators and oil presses; pressure or mine pumps; horizontal power pumps and air and circulating pumps, etc.

Hepburn Pumps are "Martin" Pumps improved wherever improvement could be made.



JOHN T. HEPBURN, LIMITED

18-60 Van Horne Street Toronto, Ontario

CANADA
FOUNDRIES & FORGINGS
LIMITED

DROP FORGED STEEL

all sizes

Produced at
Canadian Billings & Spencer Plant
Welland, Canada

LOCOMOTIVE AND CAR WHEEL TYRES

HIGH-SPEED AND CARBON TOOL STEEL

MISCELLANEOUS SHOP TOOLS

MADE IN CANADA

ARMSTRONG WHITWORTH
OF CANADA, LIMITED

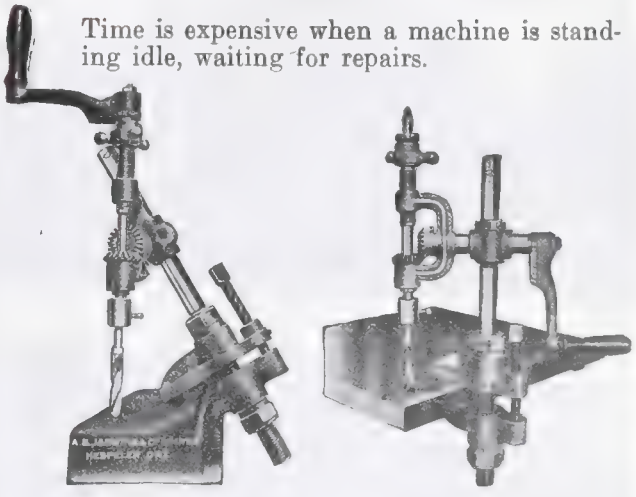
Head Office :
298-300 St. James Street,
Montreal

Works :
Longueuil, Que.

Branches :
126 Wellington St. W. TORONTO
27 King William St. HAMILTON
McArthur Building WINNIPEG

Jardine Universal Ratchet Drill

Time is expensive when a machine is standing idle, waiting for repairs.



On the average repair job, this machine completes the drilling in less than the time required to set an ordinary ratchet to begin.

Weight, 40 lbs. Price, $26.50 net

Sold by all Machinery and Supply Houses

A. B. JARDINE & CO., Limited
HESP ELER, ONTARIO

NOVO-SUPERIOR

HIGH SPEED STEEL

INTRA STEEL GIBRALTAR STEEL

Tool Steel for Every Purpose

Twist Drills, Taps, Hack Saw Blades, Milling Cutters, Files, Etc.
Music Wire for Springs, Steel Balls
Cold Rolled Mild Steel for Shafting, Etc.

We call to your particular attention that we make a specialty of and solicit your inquiries for

Circular Saws—for wood and for hot or cold metal cutting
Machine Knives—for cutting wood, paper, tobacco, agricultural.

PILOT STEEL & TOOL COMPANY, Limited, 322 St. James St., MONTREAL

Sole Agents for JONAS & COLVER, LIMITED Novo and Continental Steel Works, Sheffield, Eng.
H. BOKER & CO., Inc. New York, N.Y.

Coal
Coke
Iron Ore

Pig Iron

Victoria FOUNDRY & MALLEABLE

Made by The Canadian Furnace Co.
Port Colborne, Ontario, Canada

M.A. HANNA & CO.

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Insures Maximum Production

FIRTH'S CARBON TOOL STEELS
Standard Brands Highest Quality

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HIGH SPEED STEEL

"WACO" TRADE MARK

TRADE MARK

"DOUBLE WACO" 18% Tungsten, for Railway and Tramway Tires and Hard Metals
"WACO" 14% Tungsten, for Turning, Planing and Slotting Tools, Milling Cutters, Taps, Rimers, Twist Drills

CARBON TOOL STEELS
for
Engineers', Railway, Boilermakers', Shipbuilders', Miners and Blacksmiths' purposes in various qualities
Diamond Special Extra Best Quality Best Warranted
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Each quality supplied in different tempers to suit tool required

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for
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for
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MINERS' DRILL STEEL
In three qualities
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HOLLOW DRILL STEEL
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SPECIAL MAGNET STEEL
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"WACO" High Speed Twist Drills Carbon Twist Drills

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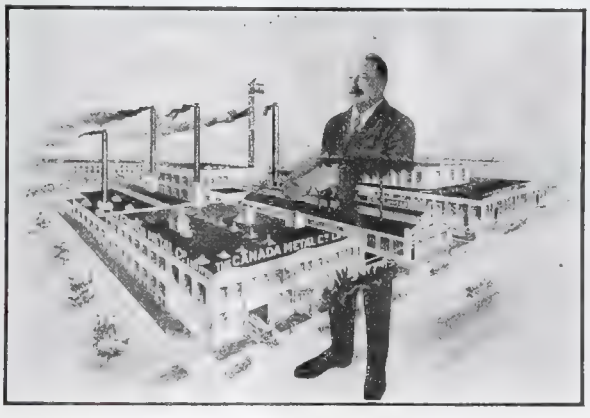

IMPERIAL GENUINE BEARING METAL
For High Speed, Heavy Engine Bearings.

HARRIS HEAVY PRESSURE
For General Machine Bearings.

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For Light Countershaft Work.

THE CANADA METAL COMPANY LIMITED
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THE

TRADE K-A-T-IE MARK

FOUNDRY
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Do Your Castings Cost Too Much?

A rearrangement of your patterns might cut their cost 25%; a different method of molding them might double your production at no increase in molding cost. **We can advise you** and we have expert metal and wood pattern-makers who are able to make any changes that may commend themselves to you.

If you need some new Patterns

send us a sample, blueprint or sketch, and ask for our advice. It won't cost you anything. If our advice is good and commends itself to you, it is only fair to assume that our work will be equally satisfactory, and we need the work as badly as you need the patterns.
We are in a position to do turning, boring, drilling or other semi-finishing operations on castings supplied by us.

ASK US

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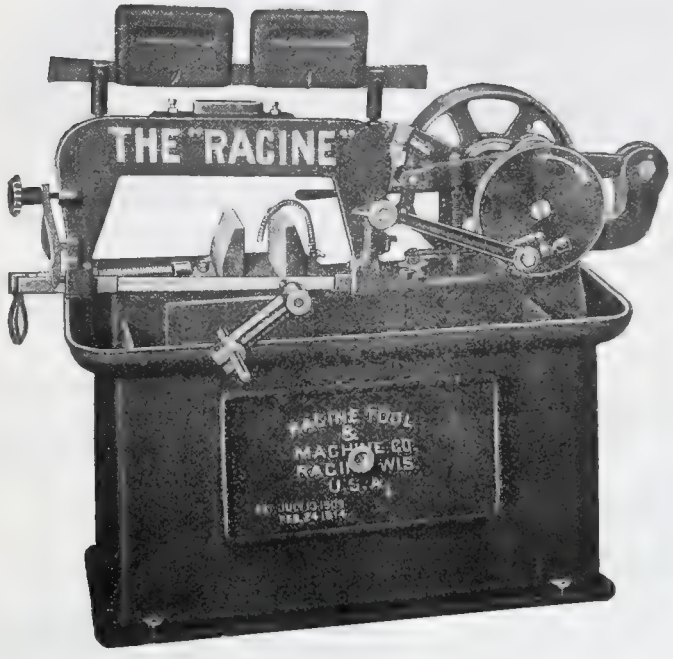

HIGH SPEED METAL CUTTING MACHINE

Reduces Blade Expense

Aside from its ability to turn out more work than any other metal cutting machine, "THE RACINE" will save you considerable money on blades alone—enough to pay for itself in a reasonable time. The automatic liftting device is responsible for that. It automatically raises the blade on the return stroke, relieving it of all dragging or strain. This also means quicker cutting, less power used and greater production.

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Use "Racine" H.S. Tungsten Power Blades

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RAWHIDE OR METAL

GRAND CENTRAL PALACE

Announcing the

International Machinery Exposition

This Fall in Grand Central Palace, New York, there will open the most advanced enterprise in the Machinery Industry announced since the signing of the Armistice.

This huge INTERNATIONAL MACHINERY EXPOSITION, which will occupy 50,000 square feet of floor space in the largest exhibition building in existence, will be a remarkable permanent display of all that is most modern and best in the great production machinery industry. Included in it will be displays of the most modern engines, lathes, milling machinery, planers, drills, screw cutters, awl presses—boring, can-making, wood-turning machines, etc. It will be one of the eight or more permanent expositions operated by the Merchants and Manufacturers Exchange of New York in this largest of exhibition buildings.

Thousands of manufacturers, buyers, purchasing agents, dealers, jobbers, engineers and others from all over the globe will visit the Machinery Exposition in this great trade mart. The buying power of these visitors will run into billions of dollars. There has been an urgent need for a long time for just such a permanent exposition.

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Here is your opportunity to place *your* product before the eyes of the world's dealers and purchasing agents—and to obtain the cumulative benefit of reaching by *direct contact* thousands of buyers.

An impressive display here will cost about one-tenth the expenses of *one* traveling salesman. October 15th is the opening date.

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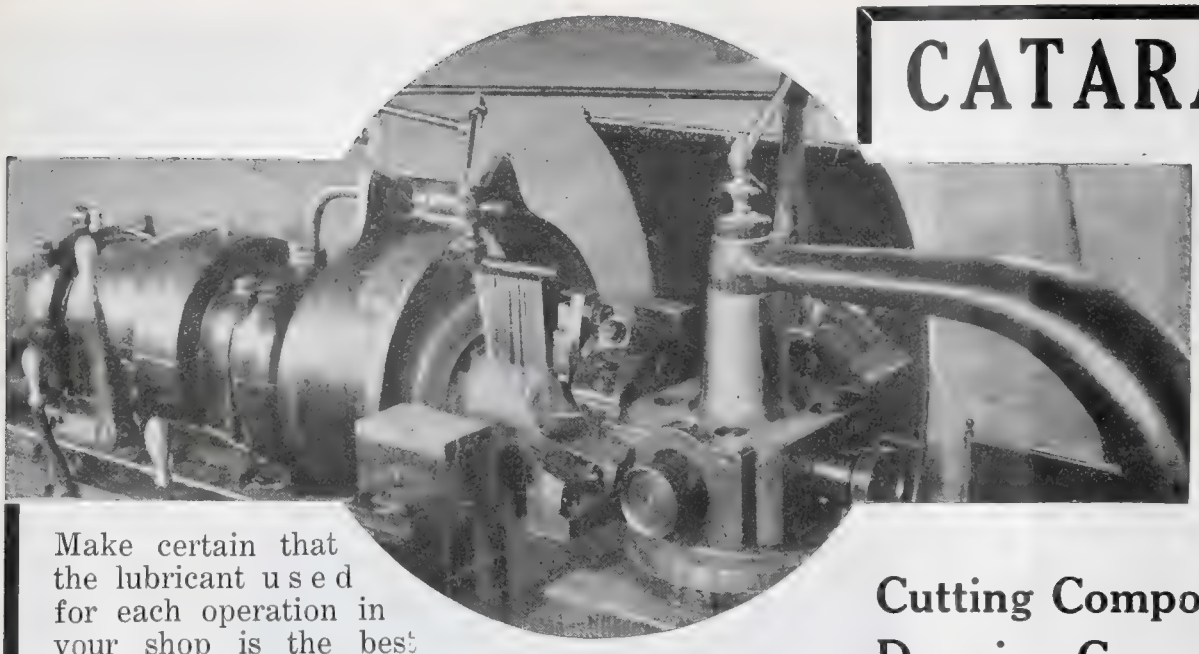
CATARACT



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represent a standard of value just as truly as the U.S. Gold Dollar. In 1880, L. S. Starrett established what is to-day the largest factory in the world devoted exclusively to the manufacture of precision tools and in all the 39 years every tool has conformed to the most rigid requirements of accuracy, utility and quality.

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The World's Greatest Toolmakers

Manufacturers of Hack Saws Unexcelled

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STARRETT TOOLS

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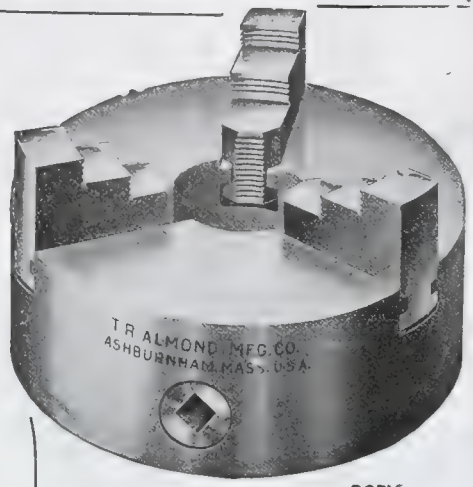
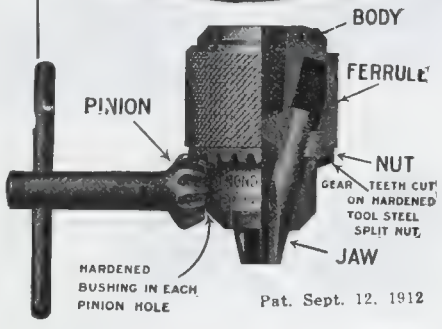
CHUCKS & MICROMETERS

Give them a try out. Universal Geared Scroll Chuck—Sizes 5″, 6″, 7½″, 9″ and 12″.



Geared Nut Drill Chucks, in various capacities, 0″ to 1″.



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English Readings, 1″, 2″ and 3″.

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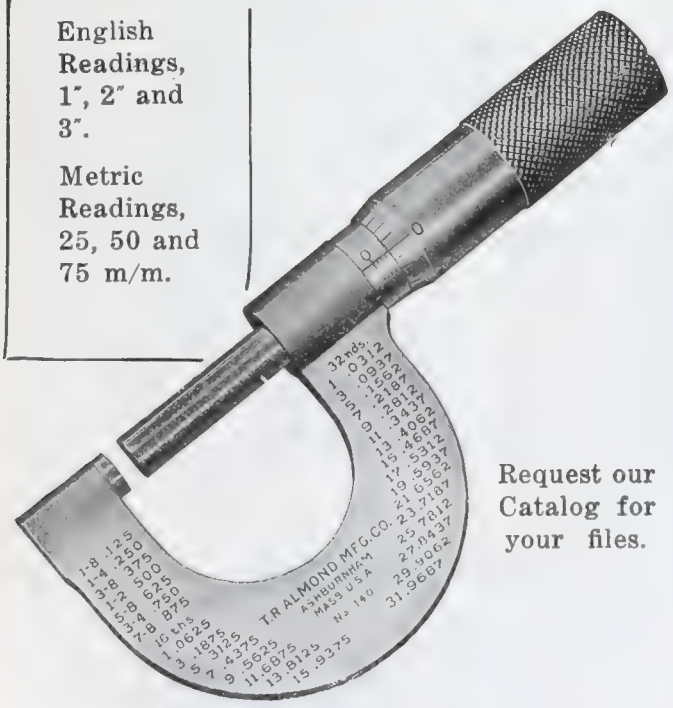

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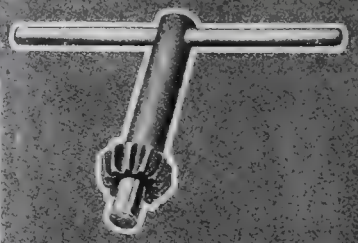
IMPROVED
DRILL CHUCK

World Famous



The secret of their success is no secret at all, its merely their Superiority

JACOBS MFG. CO.
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We've been Manufacturing
Nothing but Chucks and Their Accessories
FOR NEARLY 60 YEARS
AND OUR PRODUCTS SHOW IT

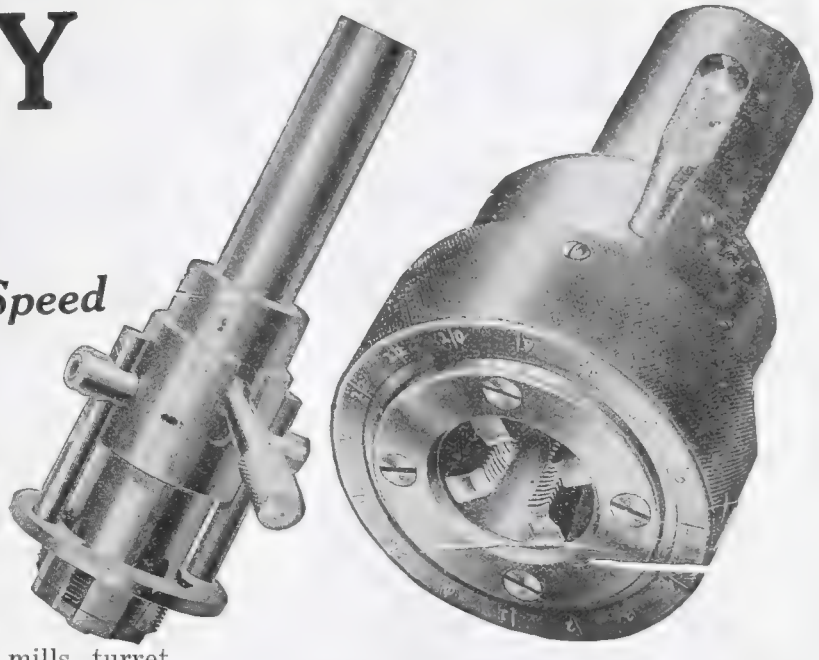
Years of experience in using our tools has convinced manufacturers that the word "Cushman" stamped upon a chuck is a guarantee of its quality and efficiency.

Let us send you our catalogue.
Cushman Chuck Co., Hartford, Conn., U.S.A.

MURCHEY

COLLAPSING TAPS and SELF-OPENING DIES

Promote Accuracy and Speed



MURCHEY Collapsing Taps and Self-Opening Dies are cleared free from the thread instantly, preventing all danger of stripping, besides cutting time for production in half. **Thus you are sure of greater accuracy and greater production.** Murchey Tools are speeding production in all parts of the country on tapping machines, drill presses, monitor machines, boring mills, turret lathes, and all other machines to which taps or dies may be attached.

Let us know the class of work you are handling and we will show you how to increase your production 50 per cent. without running up the cost.

Murchey Machine & Tool Company, Detroit, Mich.

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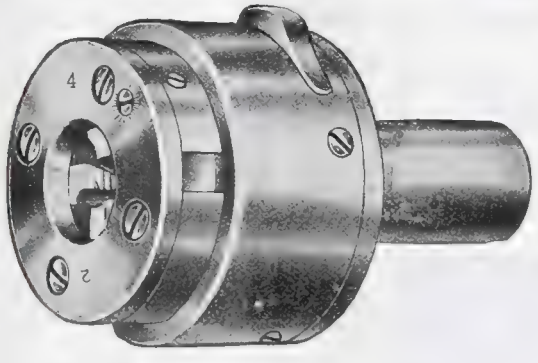
FENWICK FRERES AND CO., 15 Rue Fenelon, Paris, France.



H & G Die Heads

are of small outside diameter compared with the size of work they do.

The H. & G. illustrated is an automatic, self-opening Die Head designed especially for use on Gridley and National Acme Multiple Spindle Screw Machines and others that use the die in a revolving position. The four sizes of this Head cut up to 9/16", 1", 1¼" and 1½".

All parts are hardened and ground and interchangeable. In a word—it's an H. & G.

Ask for Catalog

Eastern Machine Screw Corp.

New Haven, Conn., U.S.A.

B-T THREAD LEAD INDICATOR

Exit Spoiled Parts

Did you ever have to scrap a threaded part because of incorrect measurement in lead? Were you ever forced, during a rush job, to thread a part over again, because it didn't fit as it should?

B-T THREAD INDICATORS

enable you to get the right thread lead instantly and maintain a constant check upon it. They will detect errors of one thousandth of an inch—can be used for testing add and even pitches, as well as internal and external threads.

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Smalley-General

THREAD MILLING MACHINES

Will give you a short cut to lower-cost thread milling.
Study the blue print and time study as given below.

MACHINE—Smalley-General Thread Miller No. 2.
THREAD—1½ in. diameter, 2 1-16 length, 6 pitch U.S. standard.

PIECE MILLED—Axle for tractor.
MILLING FEED—4.35 per minute.
MATERIAL—Machinery steel.

Tractor Axle Operation
TIME STUDY

5 minutes 37 seconds floor to floor milling both threads. Each thread milled in 65 seconds. Balance of time handling. Barker 3-jaw chuck used which had 12 in. unsupported overhang turn main spindle bearing to thread.

NOTE.—These parts were chucked through the rear end of main spindle. This was an awkward operation because the pieces were larger in the centre and the type of chuck would not let them through. A collet chuck with false collets would have permitted faster chucking.

Consult us on every phase of Thread Milling.

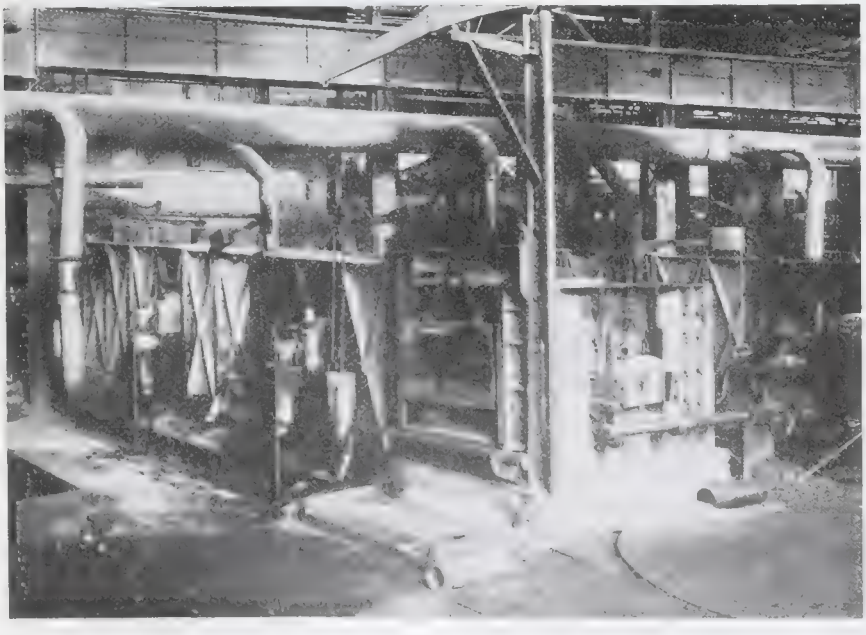
We will show you how to cut the costs.

Smalley - General Co., Inc., Bay City, Michigan

Canadian Agents: Rudel-Belnap Co., Ltd., Montreal and Toronto

Another MECOL Furnace

demonstrated its superior features point by point to a group of men whose years of experience in the heat-treatment of metals made them appreciative judges. We refer to the "Mecol" Furnace shown in this illustration, installed at the Pointe St. Charles Works of the Canadian Steel Foundries, Limited.



Our intimate knowledge of heat-treating methods, and our long experience in the building of efficient furnaces fit us to give helpful advice—and that we will do promptly if you

Write

Mechanical Engineering
Company, Limited
om 308, Bank of Toronto Building, Montrea
Three Rivers, Quebec, Canada

WHEN THINKING
OF BELTING
KEEP IN MIND THAT

The back of the OX

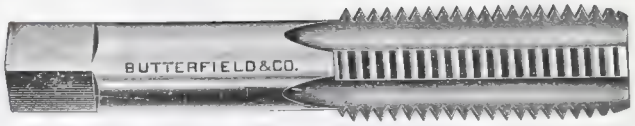
is the part where the fibre of the hide is tightest and unaffected by the action of breathing, therefore the most suitable to produce a dead straight and practically stretchless belt.

Tullis
LEATHER BELTING
COLUMBIA BRAND

is made entirely from this portion of the hide.

SEND FOR OUR ILLUSTRATED CATALOGUE

JOHN TULLIS & SON, LTD.
BELTING SPECIALISTS
ST. ANN'S WORKS
GLASGOW, SCOTLAND
Established 1834



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Milling Cutters, Taps Dies, Reamers and Screw Plates

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Butterfield Quality

It's the happy combination of specially trained men and the finest special machinery. Try it once—and you'll want it ALWAYS.

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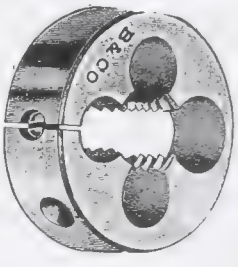

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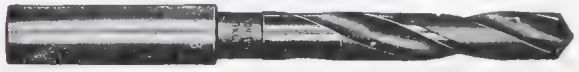
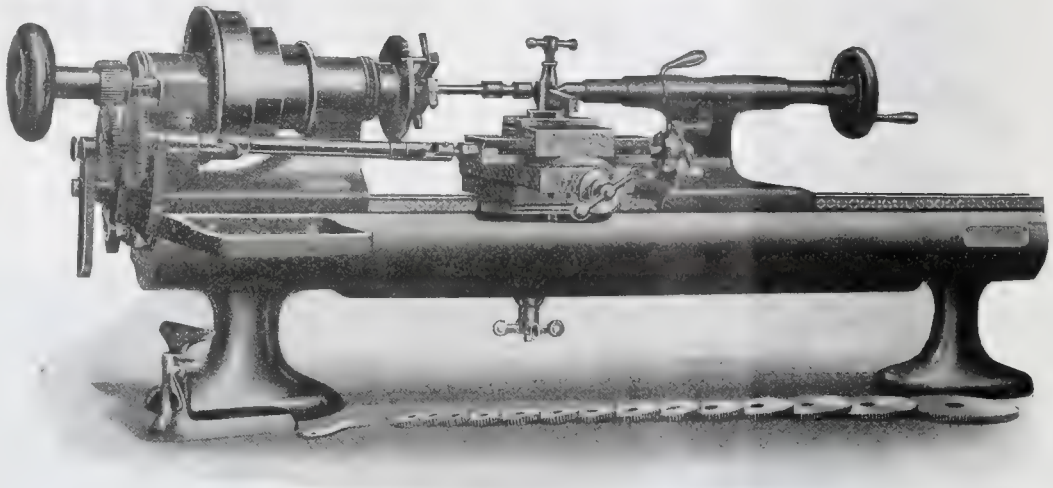


CATARACT BENCH LATHES AND ATTACHMENTS

Cataract Bench Lathes are finely constructed precision tools, with responsive controls, simple adjustments and numerous convenient attachments adapting them to a wide variety of work. **Study this illustration.** Note the base, the circular bed, the sliding tool post, massive head stock (indicating strength), range of gears, special tailstock, arrangement of gears.



Hardinge Bros., 1770 Bertau Avenue, Chicago, Ill.

ALFRED HERBERT CO., Limited, Coventry, England, are our representatives for United Kingdom, France, Belgium, Russia, Japan, Manchuria, Korea, Formosa, China, Italy.

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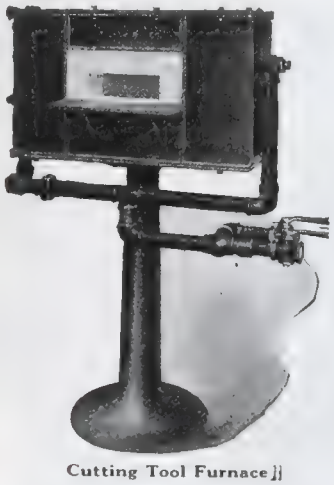
OIL or GAS

Prompt delivery on all tool room types



Cutting Tool Furnace

For
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High Speed Steel
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Furnaces built for special requirements

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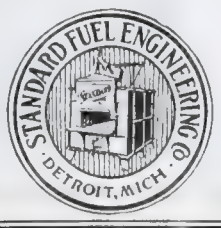
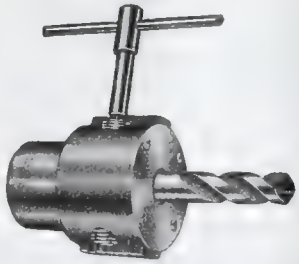
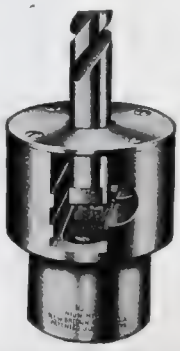




UNION

POSITIVE DRIVE DRILL CHUCKS

The Union Drill Chuck is made in seven sizes (0 to 2 inches) with PATENT TRANSVERSE SLOT—so that drills with tenons can be inserted (see illustration). The shank of drill should be squared on two sides to enter the TRANSVERSE SLOT, giving a positive rotation to the drill independently of the jaws, permitting the jaws to centre and align the drill accurately. The drill is held absolutely true and will not slip under the hardest strain. This type of chuck will be found to give the best results on all classes of work from HIGH SPEED drilling to the hard BLACKSMITH and GENERAL REPAIR work.



UNION Manufacturing Co.
New Britain, Conn.

New York 26 Cortland St.

Makers of a complete line of chucks

-And I Always Thought That Was A Good Tractor-

Some little part gave way and his Spring plowing was delayed for a couple of days. His good opinion of your tractor is gone forever; others will hear his tale and your distributor in that territory will fall two or three short of selling as many of your tractors as he would have sold if it hadn't been for that defective part, defective because it was improperly heat-treated.

It makes no difference whether you manufacture tractors or other machines or machine parts, unless you have the right heat-treating furnace the reputation of your product is in constant jeopardy.

You Cannot Afford to Take Such Chances

GILBERT & BARKER Heat-Treating Furnaces

insure uniform high quality of produce because they are designed right and built right. The combustion in a G. & B. Furnace is 100% efficient, temperature control is one of the big features, the heat is uniform always, the result is a finished product of maximum tensile strength which will stand up under the hardest usage.

The operating cost of G. & B. Furnaces is extremely low.

Send for Bulletin 24. Let our Engineers suggest the furnace that is best suited to your requirements.

To-day is a better day than to-morrow—write.

Gilbert & Barker Mfg. Co.

17 UNION STREET

SPRINGFIELD, MASS., U.S.A.

Established 1865

New York Office: 26 Broadway

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Williams & Wilson, Limited, Montreal, Que.

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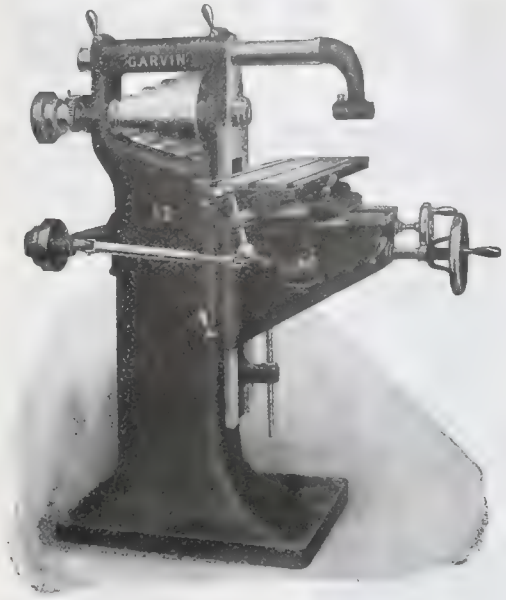


No. 12 Plain Milling Machine-Use Code Abrade

NO. 12 PLAIN MILLING MACHINE

FOR ALL LIGHT MANUFACTURING

This machine is built especially strong and substantial for a tool of its capacity, and has many valuable features worthy of special mention. The slide is fitted with a quick pitch screw, giving one inch per turn. This combines the rigidity of a rack feed with the steadiness of the screw feed. The table has an oil pan all around it, with finished edges—automatic feed, trip and reverse—adjustable nut on the feed screw to take wear—the Feed Screw is hardened.

Adjustments .....18 x 6 x 15 in.

For Further Information ASK YOUR DEALER or WRITE US DIRECT

IMMEDIATE DELIVERIES

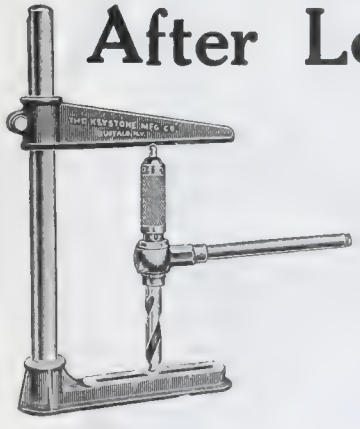
Send for Complete Catalog

Manufactured by

THE GARVIN MACHINE COMPANY

Spring and Varick Streets ***(Visitors Welcome)*** **50 Years New York City**

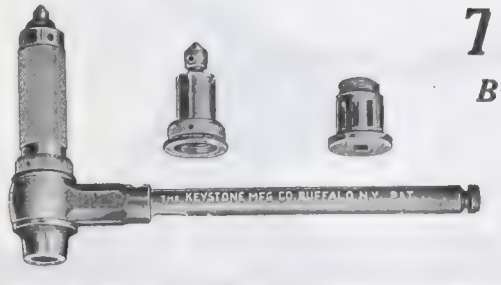
"Keystone Quality" Will Still be There After Long Use Has Worn Away The Name



We like to think of that.

We like to think that the reputation of Keystone Tools is built upon a foundation of service with **Quality** the Keystone rather than a copyrighted name. For it is conceivable that imitators, or even the whims of courts, might rob us of our copyrighted name. But who could take "Keystone Quality" from Keystone Tools?

Write for name of nearest dealer.



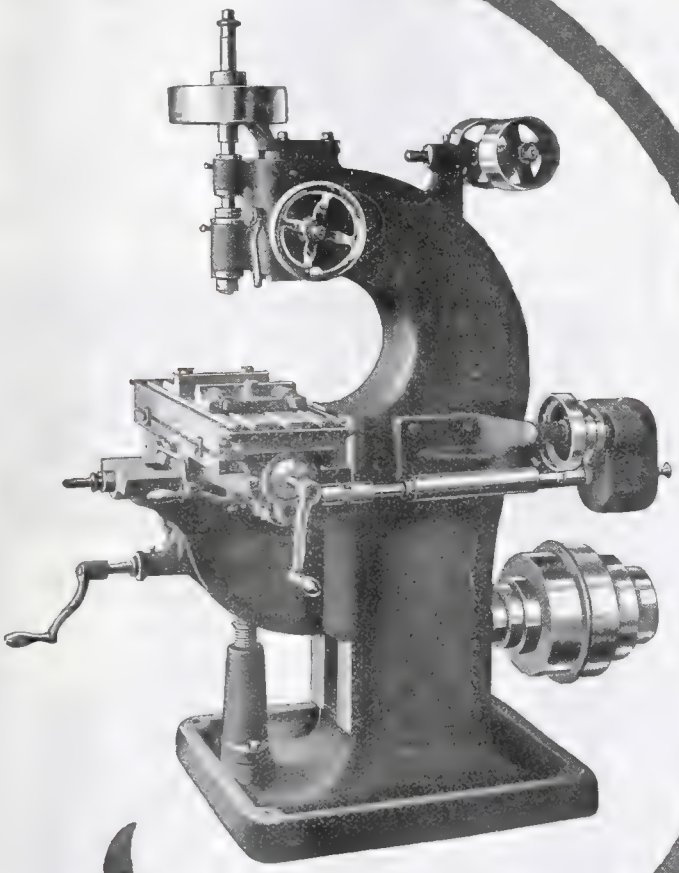
The Keystone Mfg. Company

Buffalo, N.Y., U.S.A.

BRISTOOL

Bristol Vertical Milling Machine

A Tool of Large Capacity



Ball Bearings are used at the most important points making it a free running tool, which, combined with its being a belt-driven machine, makes it capable of turning out work on which an extra smooth finish is desired.

The longitudinal table feed is controlled by the gear change box which gives six different feeds for each change of spindle speed. A stop to gauge with micrometer adjustment is used on the head to regulate the depth of cuts.

Learn all about its production capacity.

Write for bulletin giving fullest particulars.

BRISTOL MACHINE TOOL CO.
SUCCESSORS TO C. G. GARRIGUS MACH. CO.
BRISTOL, CONN.

Notes On Grinding

NORTON COMPANY WORCESTER MASS

No. 64A

Semi-Steel

The composition and physical properties of semi-steel are not generally understood, and this often leads to difficulties in selecting proper grinding wheels. Semi-steel is a cast iron alloy and must be classed as cast iron, although it is really of a little higher grade and somewhat stronger than ordinary gray iron. Table 1 will show its chemical properties as compared with those of gray iron.

TABLE I.

Analysis of Gray Cast Iron and Semi-Steel.

	Silicon %	Graphite %	Combined Carbon %	Total Carbon %
Gray Cast Iron	2.00	3.10	0.30	3.40
Semi-Steel	1.75	2.80	0.40	3.20

Although semi-steel could undoubtedly be made from materials which are commonly used for cast iron, it is practically always produced by charging with these a certain amount of steel scrap to bring total carbon desired.

Because steel has a higher tensile strength than cast iron, many have inferred that it was the steel addition which made semi-steel stronger than the ordinary gray cast iron. The rather unfortunate name, semi-steel, apparently was given because of the steel used and the intermediate strength which the resulting product possessed. However, during the melting down of the charge the steel scrap becomes molten and its constituents merge with those of the other iron material charged.

The physical properties of the steel which have been used in the mixture have been entirely obliterated during the melting process. You will note from Table 2 that the tensile strength of semi-steel is increased somewhat over gray cast iron, but that it is still far below that of cast steel. Its weakness under shock is also shown in the number of blows required to break a bar of given size. Its resistance to shock is only a very little greater than cast iron, only half as much as malleable cast iron, and one-eighth as much as cast steel.

TABLE II.

Alloy.	Tensile Strength lbs. per sq in.	No. of Blows to Break.
Cast iron (gray)	23,400	7
Semi-steel	35,050	11
Mall. cast iron	37,140	22
Cast steel	72,120	92

This places semi-steel quite definitely in the cast iron class, and CRYSTOLON wheels will be found more efficient generally than wheels composed of regular ALUNDUM. In a few cases, however, regular ALUNDUM and No. 66 ALUNDUM have been used to good advantage on semi-steel piston rings and such articles.

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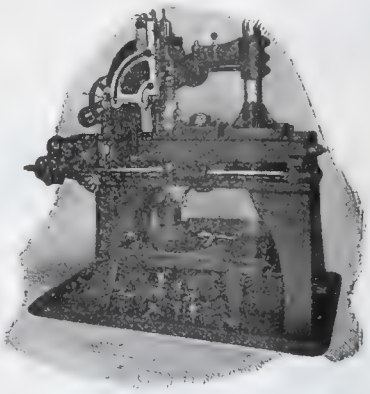

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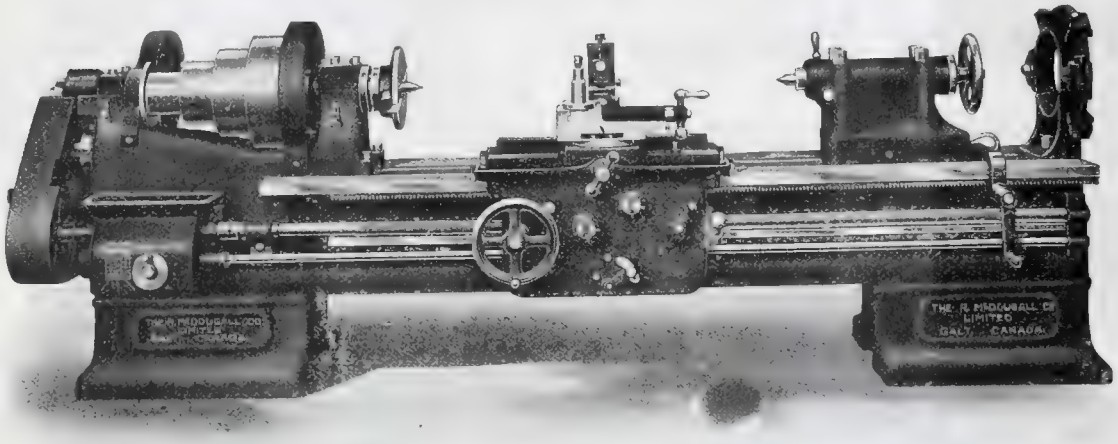

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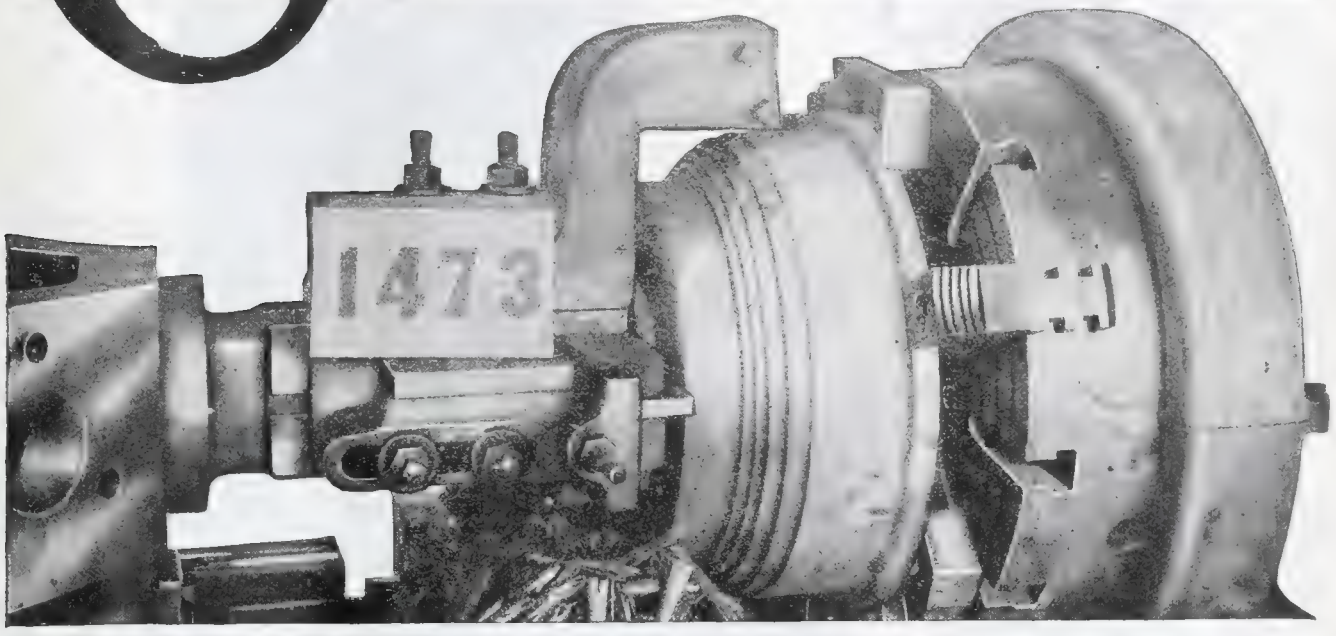

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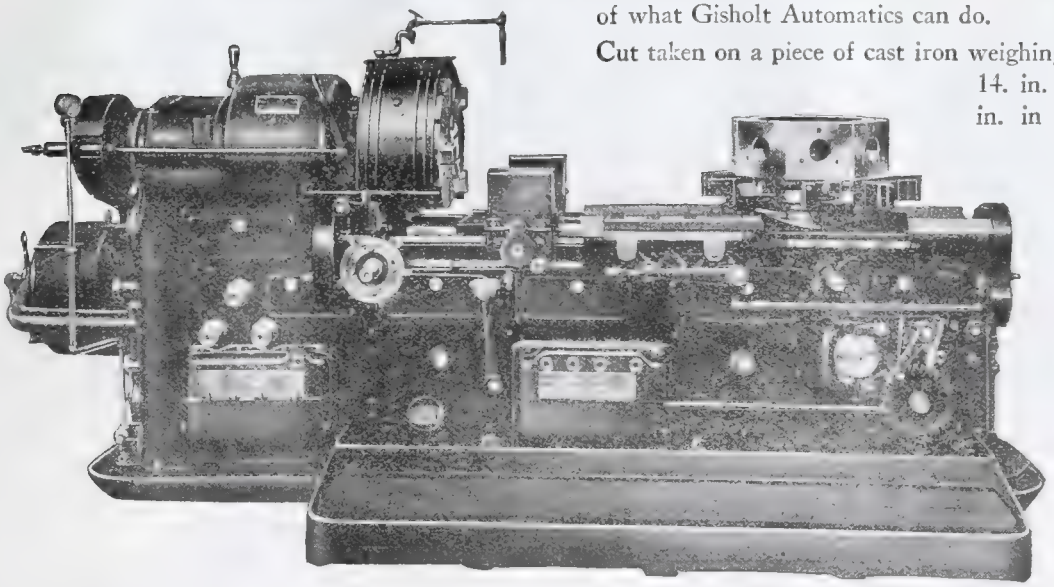

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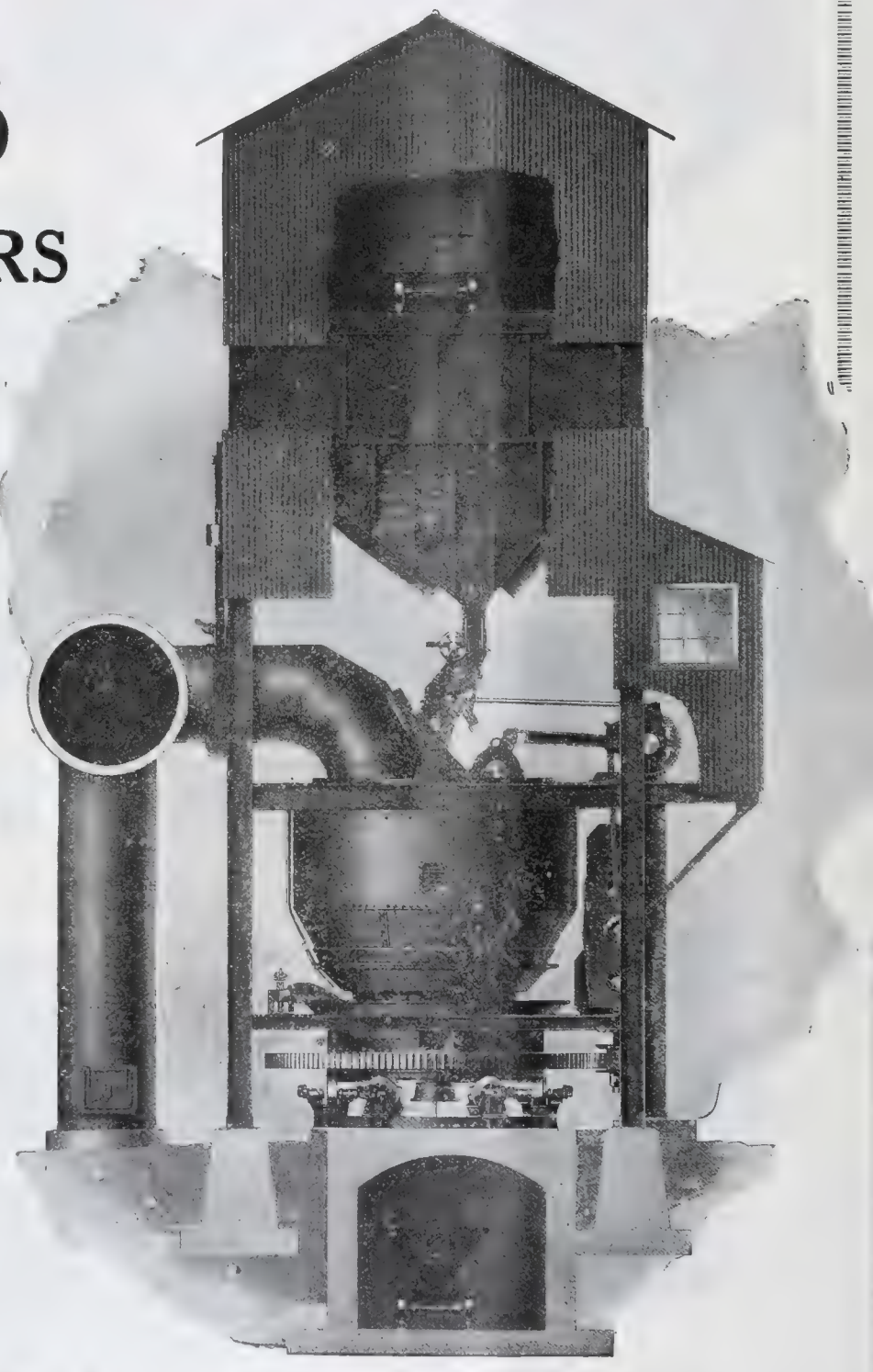

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CANADIAN MACHINERY
AND
MANUFACTURING NEWS

Volume XXII. No. 9 Toronto, August 28, 1919

The Use of the Crane in Modern Industry

Various Illustrative Examples of Crane Installations as Adopted in Various Lines of Industry. Without These Most Necessary Aids in Speeding Up the Work, We Would Be in a Sorry State

By J. H. MOORE, Associate Editor Canadian Machinery

TO thoroughly cover the field of usefulness of cranes in the industrial world would take a volume, but we will, in a brief way, discuss this subject, more by illustrations than by words, for after all, pictures will bring to the eye far better than written description could ever do the wide variance of their uses.

The Chain Block

Let us first consider the chain block. Of course we will not attempt to say that the chain block is always the most suitable device, but there is many a case where a chain block is the best possible solution to your handling problem.

A properly-designed chain block will perform a great number of lifting oper-

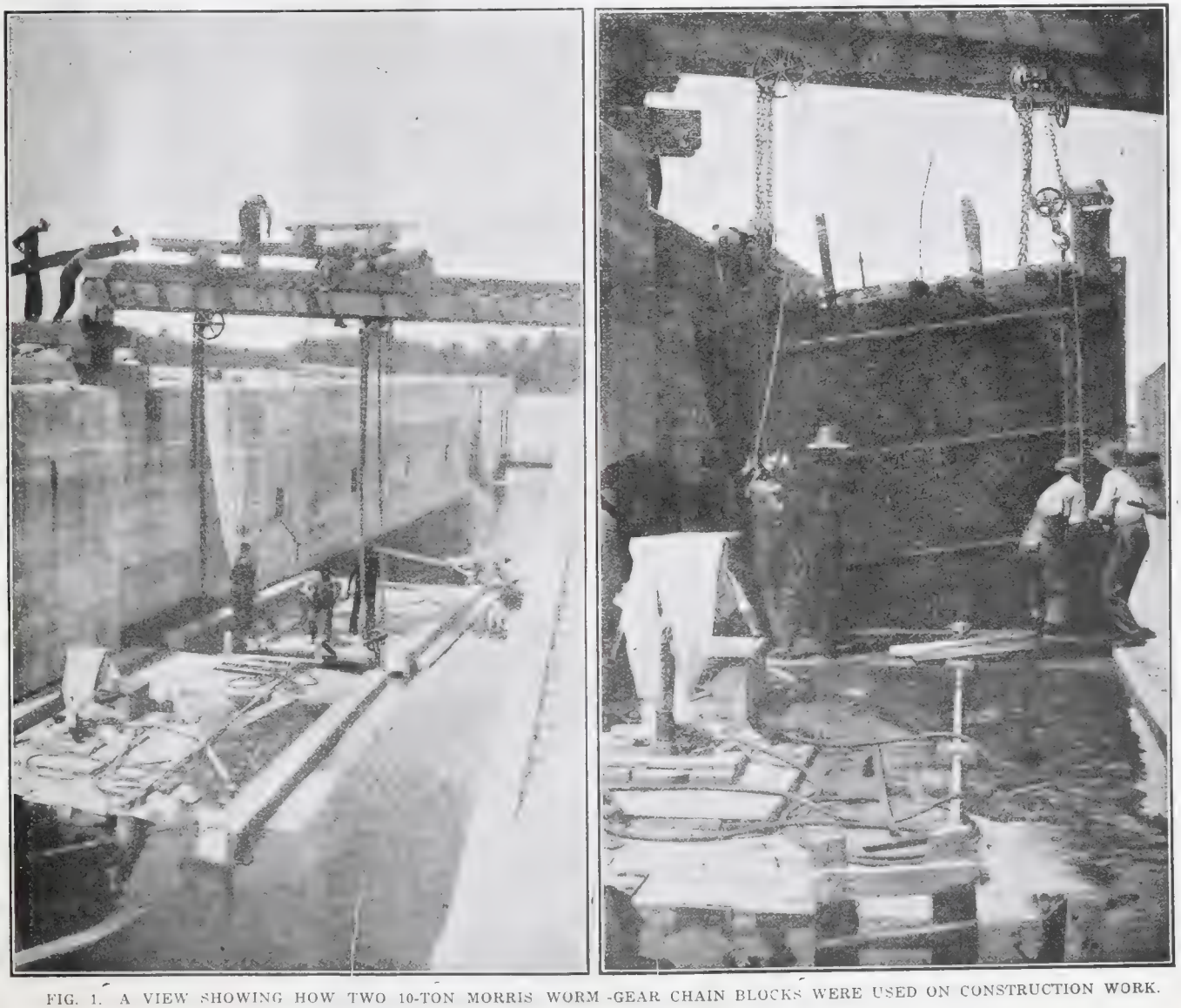


FIG. 1. A VIEW SHOWING HOW TWO 10-TON MORRIS WORM-GEAR CHAIN BLOCKS WERE USED ON CONSTRUCTION WORK.

ations with very little capital investment, and when the chain block is carefully manufactured the operating expense will be reasonably small.

There are various styles of these chain blocks, one of which is the worm-gear design. This type is a light rugged hoist, very popular among contractors, erectors, and constructional men generally, because it is easily handled and will withstand a great deal of rough usage. Where there is any danger of a load coming suddenly on the hook, such as the slipping of a heavy piece, this as a particularly suitable type of hoist, especially when fitted with a shock absorber.

In capacities of ten to sixty tons the worm-gear chain block is superior to any other type. The worm and worm wheel reduction lends itself admirably to obtaining the high purchase necessary to lift a heavy weight without the use of an excessive number of sheaves and falls.

Spin Gear Blocks

This type of block is already well known for its general efficiency. For regular day-to-day service this type of block is ideal. A machine shop without a few of these blocks installed is like a boat without water to float it—not of much account.

Then there is the triple gear chain block, and the gravity-lowering chain block. These are all, so to speak, offshoots of the former, and each type accomplishes its own particular purpose. So now, since we have briefly discussed these various types let us see some of them in actual use.

At Fig. 1 we illustrate two 10-ton worm-gear chain blocks on construction work. The particular work being done is that of lifting into position the ponderous lock gates of the Severn Canal. This operation, without the use of blocks of this nature would indeed have proved a difficult task, but as arranged the job was a very easy one.

The Machine Shop

The use of spur-gear chain blocks in the machine shop is not as common an occurence as it should be.

It stands to reason that if a workman cannot handle his work easily his movements will be slow and clumsy. Should the lifting part be very heavy, he soon acquires a distaste for his work, and thus production suffers.

A scheme to help the workman accomplish better and quicker work is shown in Fig. 2.

Here we illustrate how the operator at the grinding machine can be relieved of considerable labor by means of a spin-gear chain block.

The Overhead I-Beam System

By the use of overhead I-Beam runways, further advantage to the shifting and lifting problem is obtained. To state all the uses where I-beams can be used is impossible, for practically every condition imaginable lends itself to this method. For example, let us take two widely different examples. A certain firm which were dipping a considerable amount of steel sashes, installed an overhead I-beam system, with the necessary curves, etc, and in conjunction with this installed a small air hoist. Their production soared beyond even their most sanguine expectations after this installation.

The other installation was in a certain warehouse where the overhead system was placed in operation. It was desired that only a single track be laid, or rather hung, as the I-beam is suspended from

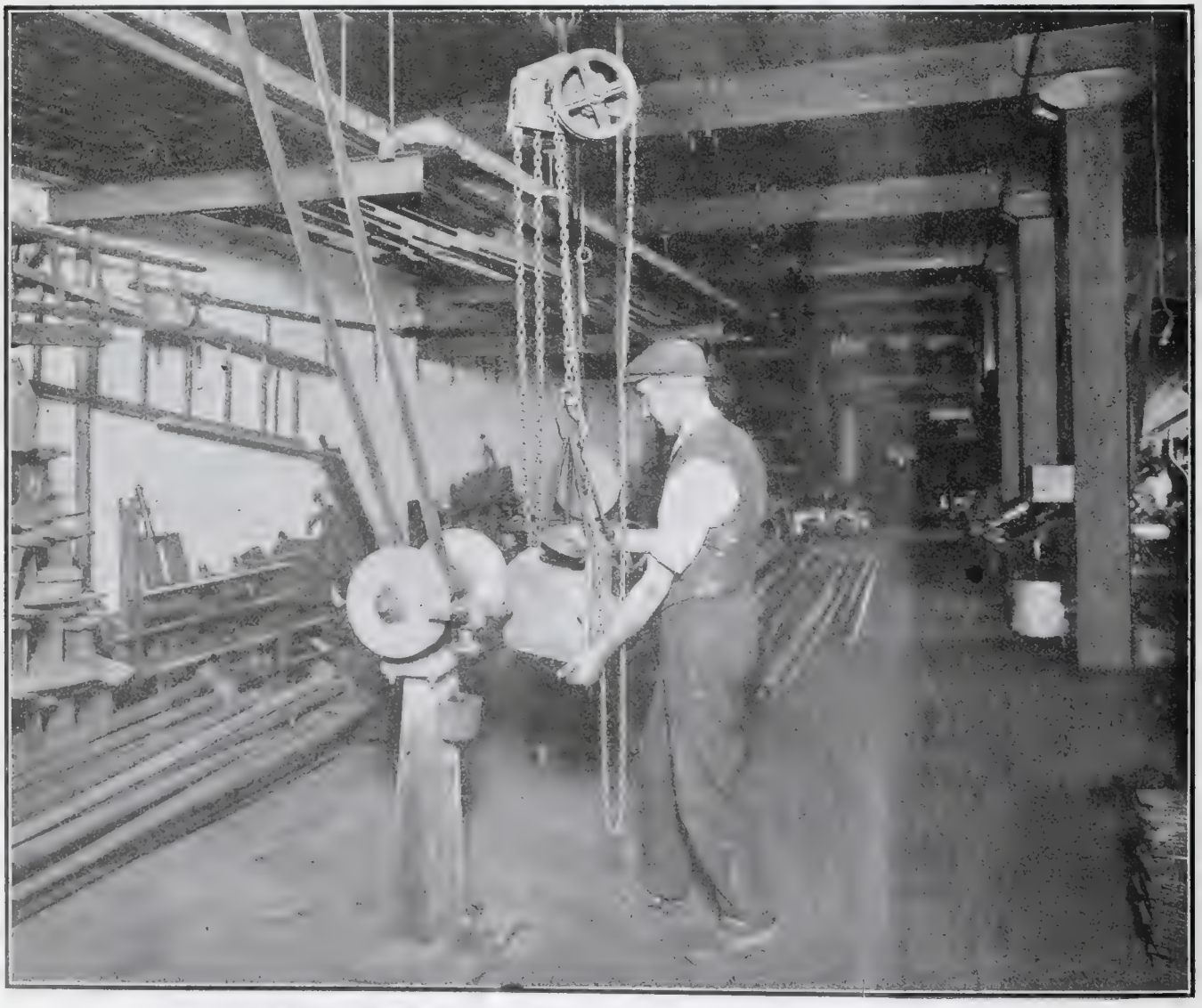


FIG. 2.—USING THE MORRIS SPUR-GEAR BLOCK AT THE GRINDING WHEEL.

the ceiling, and yet it was often quite necessary that men pass each other with loads. A by-pass was installed with splendid success, and the problem, if such we could call it, was solved without effort.

The advantages of this overhead system are without number, for by means of switches, by-passes, etc., you can practically run your crane system to every accessible corner of the plant.

Post Jib Crane

A crane of great service in the foundry or forge shop is that of the jib crane. At Fig. 3 is shown a typical installation of a jib crane, used to lighten labor and speed production at the steam hammer.

The crane used is of the V10 type, with a capacity of two tons. The freedom of action which this crane affords is easily seen, and on work of this nature cannot be excelled. It tends to make satisfied workmen and increases production to a remarkable extent.

Another place where jib cranes can be used to good advantage is at the shipping platform of the smaller shop.

The Overhead Crane

Last, but not least, we show the heavier style of hand-operated overhead crane. In an engine room such as shown, an installation of this nature is absolutely essential. The 30-ton type G crane, as it is called, has a span of 68 feet, and has twin lifting gears. With an equipment such as illustrated, should any repairs or lifting be necessary, you have to hand the means of easily accomplishing your desire.

As a summing up we can safely say that cranes fill a much felt want in the industrial field, and by a careful study of how they had best be installed we open up the way for increased production and better satisfied employees. The various illustrations throughout this article were kindly loaned us by the Herbert Morris Crane and Hoist Company, of Niagara Falls, Ont., who are well known in the crane industry of to-day. Of course it is absolutely impossible to show even a small portion of the various installations as placed by this firm, but we have at any rate brought out the importance and necessity of this type of shop equipment.

It was recently stated in a French journal that the necessity of purchasing foreign coal might be relieved by developing the water power of France, which is estimated at 10,000,000 horse-power, as compared with 7,000,000 horse-power for Norway and 6,000,000 horse-power for Sweden. Before the war only about 750,000 horse-power was used, but a further 450,000 horse-power was developed during the war, and by the end of 1921, 1,600,000 horse-power, or 16 per cent. of France's hesources, will be worked. This leaves a huge amount of water power in reserve, and, in addition, there are large potential resources in the rivers of Indo-China and French West Africa. One million water horse-power would lessen the consumption of coal for power production by at least 3½ million tons, costing about 300 million francs, and the comparison is the more striking when it is remembered that a hydro-electric installation has eight times the average efficiency of steam engines.

A copper alloy said to have the hardness of steel and of great tensile strength has been successfully experimented upon in France. It consists of 1 lb. each of chromium and aluminum, and adding 22 lbs. of copper, 5 lbs. of nickel and 4 lbs. of zinc, with intervals of between half an hour and an hour between the successive

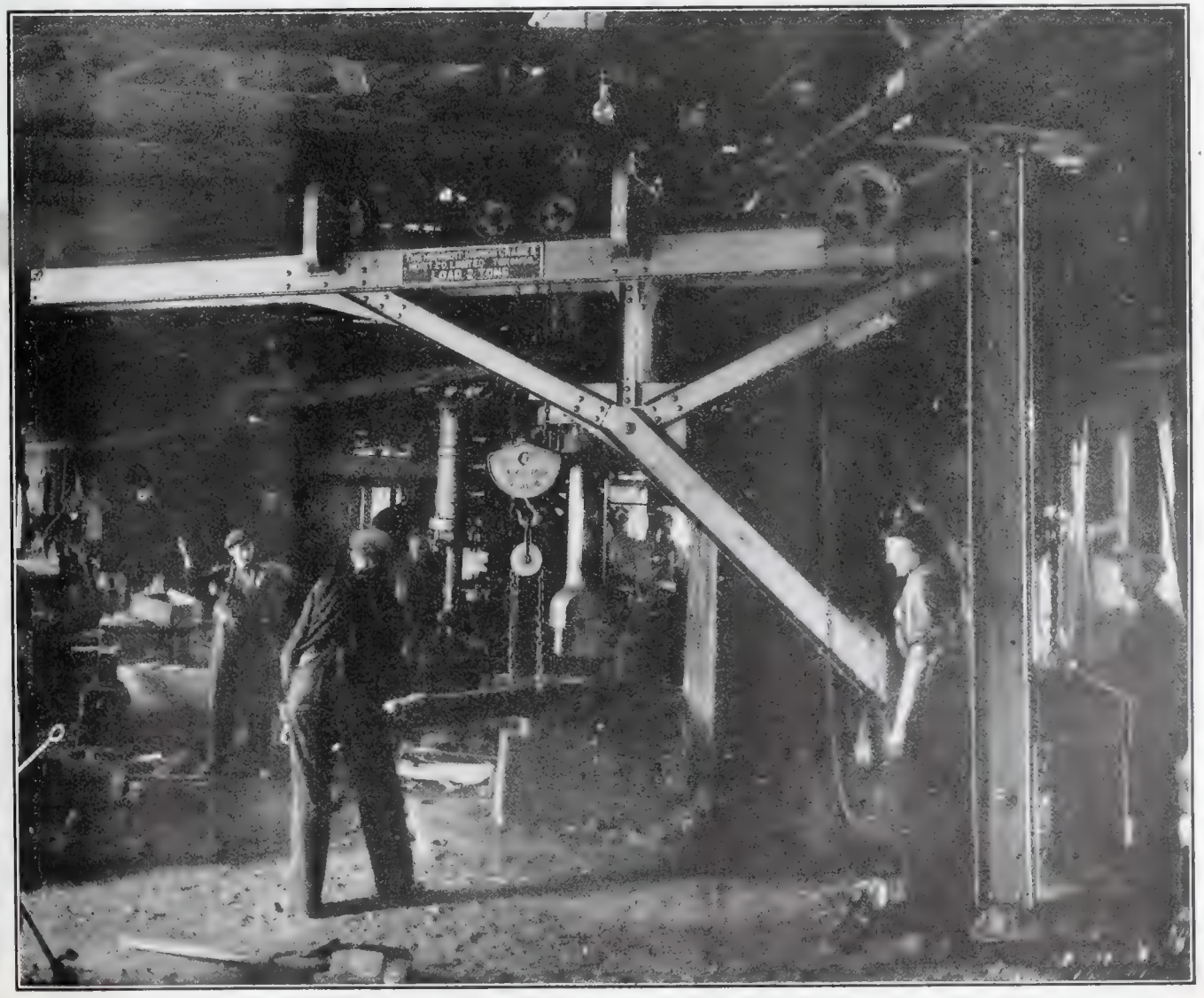


FIG. 3.—TYPE U10 MORRIS JIB CRANE SERVING STEAM HAMMER

additions to the fused mixture. By varying the proportions of chromium and copper the alloy is said to give a considerable range of properties, with adaptation to many uses.

Where asbestos and some other materials are utilized for gaskets, they are apt to stick to the metal and upon overhauling must be scraped off. This means making new members and a loss of time and a source of expense. A tight fit may be made by rubbing the packing and metal parts with dry graphite, which is not affected by heat and will allow the gaskets to be removed as a whole.

Everybody knows how hard it is to pour graphite from any ordinary container without having it spill or come out too fast and make everything black. If the graphite is put in a discarded tooth-powder can (the kind with the regulating slot in the top) not only can its flow be regulated but it is kept clean and dry.

To preserve drawings, wash the drawings well with a solution of isinglass. Prepare another solution by dissolving 1 oz. of Canada balsam in 2 oz. of best oil of turpentine. Coat the drawing with this, using a camel's hair brush to obtain an even surface.

Asbestos is a Greek word, meaning "unquenchable," but used in the sense, "inconsumable." It consists of silicon magnesia and lime of pyroxene. It was woven into cloth by the Greeks for wrapping dead bodies when they were burned in the funeral pyre that the ashes might be preserved. In ancient times the lamps that were always kept burning in the temples had wicks made from asbestos fibre. For many years after the revival of industrial activity asbestos was little used in the arts, and it is only recently that its usefulness has been fully recognized.

If a little potassium chloride is added to glue, it will tend to prevent cracking or peeling when exposed to heat.

The hardness of water is usually expressed in degrees, one degree being equivalent to a solution of one part by weight by carbonate of lime or other hardening salts to one hundred thousand parts of water. Wells generally contain the hardest water, 35 degrees of hardness being common. With water of one degree of hardness, the water contained in a single big tender would deposit 75 lbs. of mud or scale-making sediment.

Wash the files in warm water to remove the grease and dirt, then wash in warm water and dry by heat. Put 1½ pints of warm water in a wooden vessel, put in the files, add 3 ounces of blue vitriol, finely powdered, and 3 ounces of borax. Mix well, and turn the files so that every one may come in contact with the mixture. Add 10½ ounces of sulphuric acid and ½ ounce of vinegar. Remove the files after a short time, dry, rub with olive oil, and wrap in porous paper. Coarse files should be kept in the mixture for a longer time than the fine ones.

An Italian metallurgist, C. Rossi, of Legano, claims to have produced an acid-proof iron alloy by melting pig iron and ferro-silicon in an electric furnace with a small amount of iron sulphide as flux. The alloy contains from 13 to 21 per cent. of silicon.

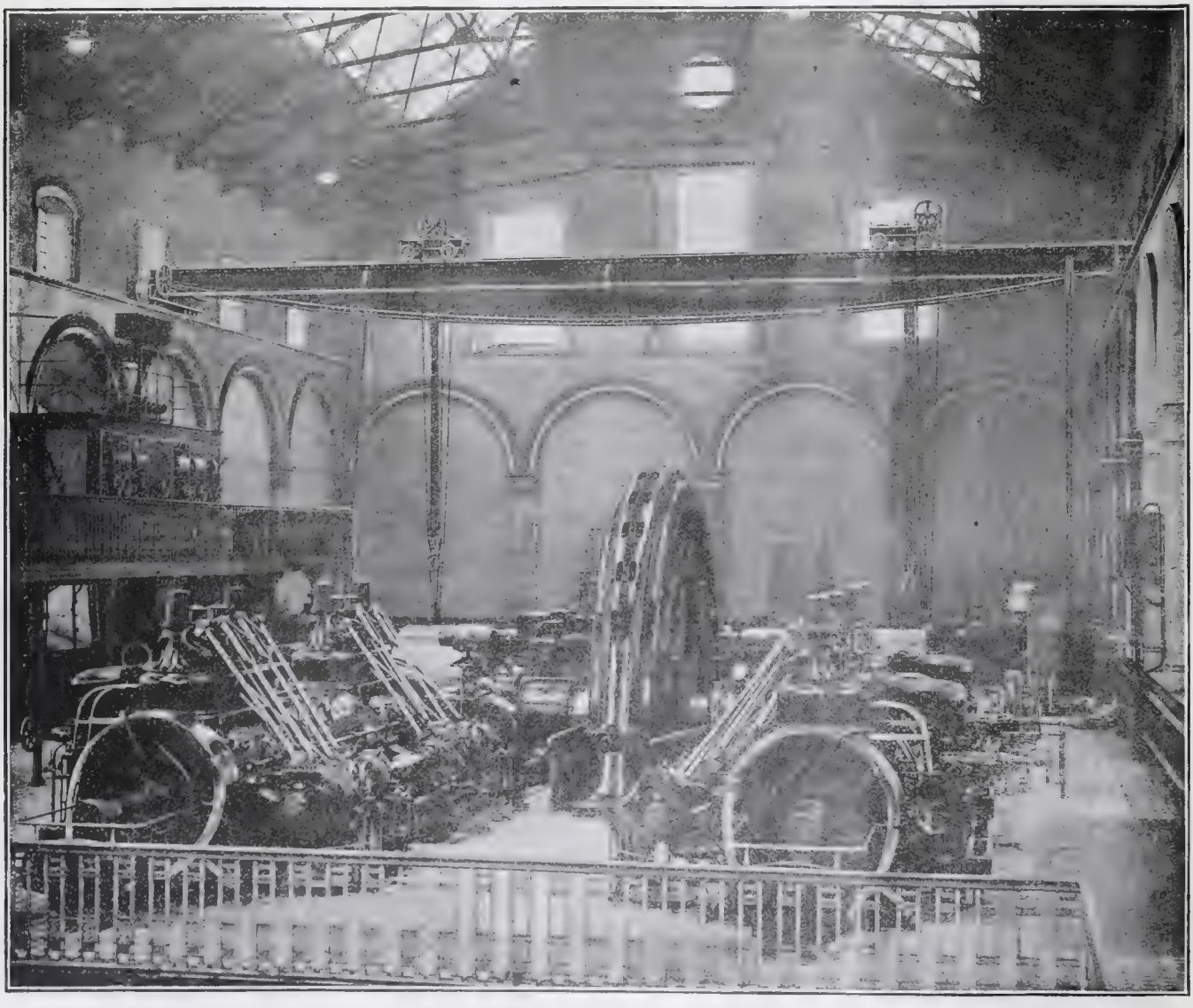


FIG. 4.—A 30-TON TYPE "G" CRANE, 68-FT. SPAN, WITH TWIN LIFTING GEARS, AS INSTALLED BY THE MORRIS CO.

The Various Mechanical Properties of Steel

Taking Up the Consideration of the Question of Brittleness, Together With Investigation of Failures of Various Kinds. A Paper of This Nature on Steel is Especially Valuable at the Present Time

By W. H. HATFIELD, D. Met. of the Brown-Firth Research Laboratory, Sheffield, Associate Member

(Continued from last issue)

THE wide variation in values obtained certainly point to indication being obtained of some intrinsic merit of the material.

In the author's opinion, the Stanton test or some modification of it, in which the force of the blow is capable of being varied with the elastic range of the steel, seems to be capable of offering much useful information to the engineer. This test is one which certainly does approximate to the conditions existing in some slightly over-stressed parts. The values obtained are influenced apparently chiefly by the magnitude of the elastic range, and are not much influenced by notched-bar brittleness; neither do they appear to be influenced by that property in the materials which are brought out in the Arnold and Sankey test. The elastic range is not, however, the only determining factor. In making these comments, it is only fair to state that the author has hitherto only employed the standard conditions laid down for this test in the Appendix. In support of the Stanton method the whole of the experimental work of Wöhler draws us to the same conclusion. The author has much sympathy with the view expressed by Stanton and Bairstow,* when they say: "For determinations of resistance to shock under approximate working conditions, the test should be one in which the energy absorbed in plastic deformation is at a minimum, since plastic deformation has little relation to its construction value." Single-blow impact tests do not afford sufficient information for the engineer, and the author feels that he has provided data in this paper sufficiently conclusive to indicate that such single-blow impact tests, depending as they do upon the energy absorbed in plastic deformation above the elastic limit, yield insufficient and probably no data as to the elastic range, and the behaviour of the material within that range.

There are no doubt concrete cases where each test will provide data of particular service in some field of engineering; and the careful study and selection of the tests to be employed in each field merits, and will repay the most careful attention of the engineer. This paper has dealt with the response of different steels to the more simple forms of test. An examination of the nature of the stresses acting on various parts of machines and structures will indicate that in many cases the stresses are not of a simple character but are combinations of tension, compression, shear, etc. To the designer who wishes to create a reasonably safe design, and at the same time to economize and get the most out of the material employed, a knowledge of the behaviour of the material under these complex stresses is important. Much interesting work has been done in investigation of the effects of such stresses, notably by Guest, Hancock, Mason, Scoble, Smith and also by A. J. Becker, of the University of Illlinois. The presence of a second stress at a given point in the material, in a direction at right angles to the first, modifies the response of the material to the first stress, as would be expected. To the author it appears that a complete experimental study of all the different combinations of stresses likely to be met with in practice carried out on all those materials of construction likely to be employed, would constitute a work of far-reaching value to engineers.

Impact Tests

There are obviously many instances in which it is expedient that steel shall be stressed beyond its elastic limit, and, therefore, in such instances, some knowledge of the behaviour of the material under impact tests is generally considered instructive. Various types of tests have been devised, all with the purpose of measuring the relative brittleness of metals. They include impact-bending tests, impact-tensile, and impact-crushing tests. The author's remarks are intended to apply chiefly to those tests described in Appendix I. In all these impact tests the value obtained is essentially dependent upon the energy absorbed by the material in plastic deformation, and the experimental work by different investigators has generally been with a view to determining the factors which affect this absorption of energy. During recent years much progress has been made. For instance, it is now definitely established that the properties of the material as shown by the static tensile tests, that is, elastic limit, yield, ultimate stress, elongation and contraction of area, fail at times to reveal differences brought out under the notched-impact tests. It is generally established that, everything else being equal, the harder the material the smaller the energy required to produce rupture under the notched-impact tests. There are, however, instances where steels of the same hardness give widely different values under the impact test, and in some such instances the tensile test and, for that matter the microscope, utterly fail to give any indication of the difference in the material. It is in this respect that the Izod, Charpy, and such impact tests given information of interest. Two pieces of the same steel may be hardened and tempered to have similar tensile properties, and yet have widely dissimilar properties under the notched-bar impact and notched-bar slow-bending tests. Much work has been done in this direction by a number of investigators, but a complete and valuable treatise on this subject was presented by Captain Philpot some months ago.* In this paper, Philpot confirms the earlier work of Stanton and Bairstow,† indicating that the shock in the test is not the determining factor, and shows that the type of notch is essential. He records a number of interesting experiments in which notched bars are broken under a static load and such disparities in values as are obtained under the Izod notched-bar impact tests are equally well brought out when the load is slowly applied. His experiments also clearly indicated that up to, and for some considerable distance beyond, the range of pro-

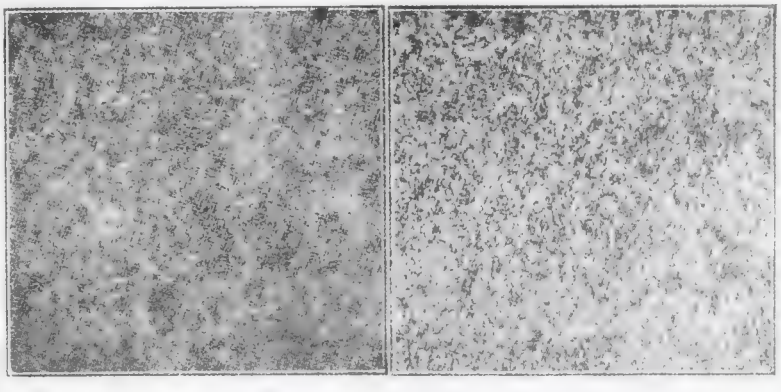


FIG. 7.—BAD CONDITION NICKEL-CHROME STEEL.
X100 DIAM. ETCHED. X500 DIAM.

*Proceedings, I. Mech. E., 1908, page 889.

*Inst. Auto. Eng., 1918.
†Proceedings, I. Mech. E., 1908, page 902.

portionality, the behaviour of the two steels was identical. These facts are of fundamental importance to engineers.

The influence of the shape of the notch has been very thoroughly investigated, and it is clearly shown that with increasing sharpness of notch the discriminating value of the test is increased. As an instance of the comparative effect of the shape of the notch, it may be pointed out that the Charpy test with a 2-3 mm. radius, shows a much less disparity in the materials in unlike condition than does the Izod test; a reference to Fig. 5 (page 618), which contains the results of the Izod and Charpy tests, will confirm this.

It was long thought that the speed of application of, and the total energy of the blow had an influence upon the energy absorbed in breaking the test-piece. This has now been shown to be a mistaken view. There are several sets of experiments now in existence covering this point, and the author has published the result of investigation,‡ in which it is clearly shown that with Izod impact-pieces breaking with an absorption of 20 ft. lb. to 25 ft. lb. energy, it is immaterial whether the blow be 150 ft. lb. or 50 ft. lb.

Other points have been taken up such as the effect of the temperature at which the test is carried out, and a bibliography is attached to this paper for those interested in the subject, Appendix II.

As regards repeated-impact tests, the total energy required to fracture the test-piece increases as the number of blows required increases. This is largely due to the fact that each blow includes a certain amount of energy necessary to produce the elastic deformation, and this proportion naturally forms the larger percentage of the energy of the blow when the blow is small in value. As to the actual energy absorbed in plastic deformation it is an open question as to how this value is affected with the reduction in the force of the blow. There appears to be in all repeated-impact tests a limiting value of blow which can be indefinitely withstood by the material.

The author is, however, only dealing with the impact test in so far as it is of interest as indicating dangerous brittleness in steels from the engineer's point of view. From this standpoint it might be useful to endeavor to trace the mechanism of the action of rupture in one of these tests. For this purpose it is proposed to discuss the Izod test. The actual pressure exerted by the knife-edge on the piece is determined by the amount of resistance which the piece offers to deformation. The resistance commences at zero and increases rapidly at first, presumably in proportion to the deviation of the piece from the vertical. This phase will only continue during elastic deformation (which is extremely small), owing to the piling up of the stress near the bottom of the notch, and the elastic limit of the material will be reached locally at a very early stage, whilst the remainder of the test-piece will be almost unaffected. At this stage plastic deformation commences. In non-brittle materials it is to be anticipated that plastic deformation will then proceed, with the drawing out longitudinally and contraction of area of the steel close to the bottom of the notch taking place. The region affected plastically will gradually enlarge, the outlying portions being always less severely strained than the original base of the notch. In this way the deformation continues until the most drastically deformed portion has received the maximum drawing out of which it is capable, and then it will crack. The crack, once in existence, will rapidly spread. The base of it (when definitely formed) being sharper than any notch made by machining, causes such abnormal local stressing relative to the surrounding material, that the original crack always extends in preference to rupture, commencing afresh at any other point. The back face of the test-piece (not notched) is all the time under compressive stresses, but owing to the more uniform distribution, the actual maximum compressive stress at any point, before permanent deformation occurs, is very small in comparison with the tensile stress at the notch. During the plastic deformation, however, this compressive stress increases, and it may reach such a value that locally there may be fracture by shearing, and an appreciable bulging similar to, but not so marked as, that of the ordinary bend-test. A slight modification of shape of section on the notched side, feebly imitating that in an ordinary bender, is to be expected. The form of fracture usually indicates whether an appreciable amount of plastic deformation has taken place at the fractured portion, previous to the progression of the crack. In brittle materials the "crack" appears to be first started at a very early stage of the plastic deformation. It may be suggested that the bulk of the energy absorbed in the test is that due to the work done on the test-piece, in plastic deformation previous to the commencement of the crack, very little being absorbed before this begins (elastic deformation), and very little after, that is, during the extension of the crack. The relative proportions of the three stages of work will obviously vary with different materials, or conditions of the same material. It would appear from this argument that a governing factor in determining the amount of energy absorbed in the test is the degree to which the material can be plastically deformed before the formation of a "crack." This would be expected to run parallel with the elongation per cent. of a tensile test-piece (or preferably with the reduction of area per cent.) and a low elastic. While this generalization is in the main borne out by impact values, the agreement is only approximate, and, as previously discussed, there are exceptions. It must, therefore, be concluded that failure as at a shoulder or the bottom of a notch, is determined not only by the degree of deformation but also by the manner of distribution of the stresses.

In the latter sections of this paper results of experimental work will be given in illustration of the diverse values obtained from different materials, and at this stage the author proposes to content himself by showing that even wrought-iron of the highest ductility is susceptible to variations in notched impact test values, the values under static test remaining practically constant. He was successful in obtaining a bar of excellent wrought-iron. In Fig. 7, page 228, will be found the microstructure of this material in the condition as received, at 100 diameters and 500 diameters respectively. It will be seen to consist entirely of iron crystals, the only other constituent being a little slag left in during the process of manufacture. Any slag present in the test-bars experimented upon ran the length of the bar, being striated at right angles to any blows reviewed in impact testing. Chemical analysis curiously enough showed that this specimen of wrought-iron contained a little carbon, the value being somewhere between 0.05 per cent. and 0.08 per cent. As regards other constituents, the silicon was 0.03 per cent., manganese 0 08 per cent., sulphur 0.013 per cent., and the phosphorus 0.019 per cent. It will thus be seen that we have here an exceptionally pure commercial wrought-iron. Tensile, Izod impact, and Brinell determinations were done upon this material in different conditions, and the figures derived from determinations on a selection of the treatments are given in Table I.

These experiments establish that in a most ductile iron with an elongation of 40 per cent., and a reduction of area of over 60, the impact values may vary from over 70 down to nearly 20 without the values under the static test being seriously affected. These few tests have been selected from an investigation at present in progress, and the author does not propose to burden his paper with a metallurgical discussion of the results. Suffice it that here we definitely have curious anomalies from the metallurgical standpoint. but data sufficient to show that even the most ductile materials can

TABLE I.—TENSILE, IZOD IMPACT AND BRINELL DETERMINATIONS ON WROUGHT-IRON. (Fig. 6.)

Condition.	Elastic Limit.	Yield-Point. tons per sq. in.	Maximum Stress.	Elonga-tion per cent.	Reduction of Area. per cent.	Fracture.	Izod Impact. ft.-lb.	Fracture.	Brinell Hardness Numbers.
As received	8.5	9.25	18.93	40.0	64.71	Fibrous	62	Fibrous	67
Quenched from 830 deg. C.		6.74	17.09	43.0	64.71	Fibrous Silky	77	Fibrous	65
Quenched from 770 deg. C.		9.82	18.48	41.5	64.7	Fibrous	22	Coarsely crystalline	67
Quenched from 750 deg. C.		8.0	18.8	38.3	63.6	Fibrous	22	Coarsely crystalline	73
Quenched from 950 deg. C., tempered 650 deg., and air-cooled		11.6	18.52	44.0	64.71	Fibrous Silky	71	Fibrous	65

‡Journal of the Iron and Steel Institute, 1917, vol. ii., page 112.

be made susceptible to notch brittleness without their ductility having been destroyed. The micro-examination of impact test-pieces after deformation has already been published by the author.*

The question which has to be decided is whether we must dissociate notch brittleness from true brittleness, which must be admitted is occasionally experienced in steels; but the author proposes to defer his deductions until the concluding pages of this work. The problem to be solved is this: can, and will really brittle steel give satisfactory results under static tests, or does it need a sharp notch to bring out the evidence of brittleness.

From a theoretical point of view it is eminently desirable that we should form some idea as to the reason for variable values obtained from notched-bar tests, other values being constant. Captain Philpot in his paper, to which reference has already been made, suggested segregation between the crystals as the cause, but the author cannot accept that explanation, since he has difficulty in conceiving the segregation of material in terms of the size of crystals at a temperature at which such effects are known by metallurgists to be produced. If two pieces of suitable nickel-chrome are hardened and are then subsequently tempered, say at 600 deg. C., one being quenched in water and the other being very slowly cooled, it will be found that the one which has been quenched from the tempering temperature in water will have a high impact value, whilst the one which is cooled slowly will have a low one. This is a statement which applies to many, though not all steels, and which is now definitely accepted by metallurgists. It is the author's experience, and he knows it is also the experience of many others that the microscope utterly fails, even at the higher powers at present available, to bring out any adequate indication of differences in structure sufficient to account for the large difference in impact value. It therefore follows that it is reasonable to suppose the cause to be more deep-seated and probably lies in the ultra-microscopic arrangement of the material. It has occurred to the author that if the ultimate arrangement of the atoms could be visualized it would be found that, on quenching from the tempering temperature, the material had been trapped in a—from a crystalline standpoint—meta-stable condition, that is, the atoms would not have had the opportunity of finally attaining their stable positions in the systems of the crystals. He would therefore suggest that if after the tempering has been done at temperatures such as that under discussion, and the cooling be permitted to take place at a slow rate, resulting in a low impact value, the atoms have had the necessary time and opportunity to take up their stable situations in the crystal.

He would then argue that the reason for the difference in the manner in which the crack is extended is to be found in the relative facility with which it can travel through the diversely orientated crystals. It appears to him to follow that in a perfect crystal, cleavage planes mill offer planes of weakness along which the crack may readily run, whilst in the unstable state in which the perfection of the arrangement is not attained, he would submit that it is conceivable that the crack will not travel with the same ease. It will be seen that this line of reasoning would presuppose fracture through crystals in both ductile and "notch-brittle" material. This is contrary to the views held by some investigators, but the author, in all seriousness, considers that it yet remains to be demonstrated that fracture frequently takes place along the crystalline boundaries. For instance, he would argue in this way: a crystalline fracture leads one to suppose that there are a number of minute planes reflecting light. Since the crystals of the metal with which we are dealing have no external geometrical form, it is difficult to conceive how such externals of the crystals, if they were separated, could present facilities for the reflection of light in the manner which to him appears perfectly obvious from crystalline fractures. It might, therefore, be thought that he would suggest that the fibrous fracture associated with high impact values with its non-crystalline appearance, would represent the separation between the crystals; such, however, is not his view, since he holds that in the fibrous fracture a sufficient explanation is found of the fact that in the transit of the crack through the crystal in this case, there is a good deal of deformation and distortion along the cleavage faces. Arguing back from the above to the region of fact, it will be remembered that we have a mass of evidence to show that most successful parts which have been submitted to the most stringent service, have had a low impact value. The inference which might be made from the foregoing is that the impact values induced by quenching from tempering temperature, involving as they do a meta-stable condition from a crystalline standpoint, also involve a crystalline instability which will probably be affected by the work which the parts are called upon to do under certain conditions of service. One fact is, however, obvious, that if it is necessary to quench from tempering temperatures to obtain high impact values, internal stressing will accompany the result, and it is an open question whether, if for no other reason, it is not better to be satisfied with reasonable impact values produced by relatively slow cooling rather than endeavor to produce the other condition of the material.

A Truly Bad Condition

Some time ago the author investigated the properties of a nickel-chrome forging which had been placed in a bad condition by an unsatisfactory final treatment. The intimation was that the Izod test-pieces in breaking absorbed no energy. The latter comment was somewhat exaggerated. However, the results of a detailed investigation into the mechanical properties are instructive. The figures obtained were as follows:

Elastic limit	13.3 tons per sq. in.
Yield-point	32.1 tons per sq. in.
Maximum stress.	44.5 tons per sq. in.
Elongation	9.0 per cent.
Reduction of area	16.6 per cent.
Izod	3 ft.-lb.
Charpy	0.31 kgm. (2.2 ft.-lb).
Stanton	666 blows.
Brinell	210

It will be seen that the steel was in a really bad condition. The impact tests clearly showed brittleness, but this was also to be seen by the tensile in the low ductility. It may be stated that the tensile values were true ones, not being in any way affected by defects such as frequently reduce ductility. The true elastic limit was low as also was the Stanton result.

A shipbuilding record was made in Belfast, Ireland, recently when the workmen completed a ship in five working days after the vessel was launched.

In a paper recently read by D. M. Buck before the American Society for Testing Materials, it was brought out that very small amounts of copper have the effect of reducing corrosion in steel. Tests were made of open hearth steel with various copper additions, so that there was from 0.012 to 0.254 per cent. of copper in the ingots. These were rolled into sheets and exposed to the atmosphere in the Connellsville coke region, together with a number of pieces in which there was no copper. It was found that a mere trace of copper was sufficient to prevent rapid corrosion.

Those using articles made of rubber that frequently lose their elasticity through oxidization may restore the material to its original condition by a simple process. Soak the part in a mixture of one part of ammonia to two parts of water. It is particularly well adapted to the restoring of rubber bands, rings and small tubing that are ready to become dry and brittle.

An unusually large weld was made recently by the Thermit process on the stern frame of the SS. Northern Pacific, which was lying at New York. The frame was broken when the vessel run aground in a fog, and is a hollow casting about 2 ft. in diameter with walls 3 in. thick. The weld required 1,400 lb. of Thermit, and proved entirely successful.

The best practice, which is practically the same as the safest practice, in the use of dissolved acetylene under pressure for welding purposes, seems to be to limit the number of storage cylinders in the building, so far as practicable, to those in actual use, or enough additional cylinders to complete one day's work. Used cylinders should be removed from the premises and returned to the manufacturer for recharging as rapidly as possible.

Handling the Product by "Trucktractor"

A Very Novel Adoption of a Tractor and Truck Combination is Herein Described. Moving Freight Cars, Trailers or Other Vehicles Becomes Part of Its Day's Work, or It Can be Used Independently if Desired

By HARRISON JENKINS

A VERY interesting adoption of the tractor and truck combination as suited to shop conditions is shown in the various illustrations throughout this article.

The Clark Tructractor Co. of Chicago, Ill., are the makers of this type of truck, and Fig. 1 shows a separate view of the apparatus.

These trucks have proven themselves to be great labor savers, and well adapted for use in the machine shop and foundry. Such firms as the Hyatt Roller Bearing Co., Clark Equipment Co., Stewart Motor Truck Co., Barney-Floyd Co., Ohio Steel Foundries, National Malleable Casting Co., Jeffery Mfg. Co., and others, have found this truck a wonderful time saver.

Its flexibility is a big feature, as it can turn on a very short radius (see Fig. 2), which is a decided advantage in many cases. The design is such that the truck body is built so close to the ground, and is so powerful that it can be used for every purpose from carrying a full ton load of shavings from the lathe, foundry sand, red hot forgings or castings, finished or unfinished parts from one machine to another or between plants. It will operate on rough roads as well as on factory floors. It will plow through snow or mud, through foundry sand, or on oil-sodden floors.

It is built and put together by efficient and highly experienced workmen, under the supervision of high-class engineers, and made to stand up under the most severe industrial service.

Some of the tasks it has been performing for the past year and a half are as follows: Moving freight cars, heavily loaded trailers, and carrying loads up to a ton and a half constantly—day after day—without breakage or mechanical troubles. The fact that it operates on 8 gallons of gasoline, ordinary working day, makes it a most economical machine.

FIG. 1. GENERAL APPEARANCE OF THE TRUCK.

Its ability to run 24 hours a day without being laid up for recharging and its economical operation, coupled with the lack of breakage, makes this machine an exceptionally efficient and satisfactory one for commercial purposes.

The fact of its having nine and one-half inches of ground clearance and an abundance of power, makes it possible to manipulate on rough ground, foundry floors, factory yards and bad roads. Sand and mud do not prevent this machine from successfully and quickly performing its duties under all weather and factory conditions.

Its great range of speed (from ½ of a mile of 15 miles per hour) permits the Clark tructractor to creep through congested places and around sharp corners, deliver its load exactly in the place desired, without danger to machinery or employees, and to run at high speed through open places and in the traffic of roads and city streets.

One of the machines was recently driven from Buchanan, Michigan, to Chicago, Illinois. This machine was stopped at several of the large industrial plants on the way and most interesting demonstrations were held. It covered a distance of 143 miles in one

FIG. 3.—USED IN CONJUNCTION WITH THE TRAILER.

FIG. 2. TURNING IN A SHORT RADIUS.

FIG. 4. USING THIS TYPE OF TRUCK IN THE FOUNDRY.

day and arrived in Chicago in first-class condition, ready to begin regular routine work in one of the well-known institutions.

The fact that this machine is built entirely of metal and that its centre of gravity is very low, makes it a most satisfactory one for foundry and forge shop use. Extreme changes in temperature do not affect its operation. Hot castings and forgings can be carried from one section of the plant to the other—quickly and without damage to the machine. It thus speeds up production, prevents congestion and increases the efficiency of these plants. It has a surprising drawbar pull and is capable of moving loaded freight cars without straining any of its parts. Heavy trailers are transported from one part of the plant to another at high or low speeds, ranging from ½ mile per hour to 15 miles per hour.

The truck is very simple to drive and operators soon become efficient and dart in and out of narrow doorways, here and there among the machines, into the sand blast rooms, about the foundry and along the highways, carrying material from department to department—from foundry to the shipping platform or station.

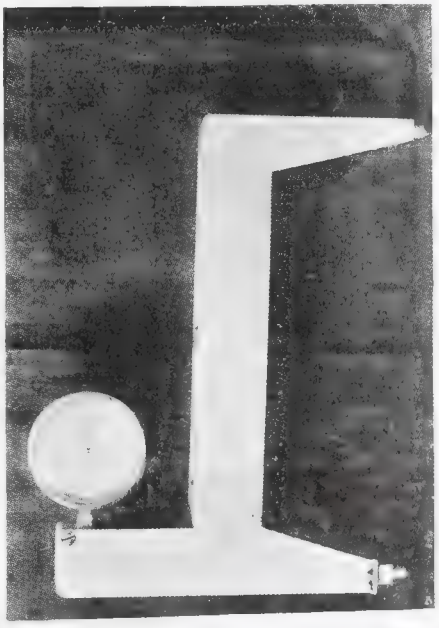
It has a carrying capacity of one and a half tons, and is supplied with either platform, cargo or dump body.

Other information desired will be given on request by the makers of this truck.

TESTING REINFORCED CONCRETE BUILDINGS WITH STRAIN GAUGE

By FRANK G. PERKINS

THE accompanying illustration shows the construction of a strain gauge of Professor H. C. Berry, of the University of Pennsylvania, for use in measuring strains in reinforced concrete buildings, as utilized by D. C. Hooker, of the Seattle Building Department. Its unusual features include a frame without rivets or screws, the side plates being joined to the spacing lugs by the electric welding process. It has checkered side plates to give better grip for the hands and a clearance of 3 in. to enable readings to be made on steel embedded deep in the concrete, also a specially constructed fulcrum joint for the movable leg. The one-piece frame is so rigid that side pressure, giving unconsciously when making observations, has comparatively little effect on the readings and there are no rivets or screws to work loose or throw unequal interior strains on the frame.



VIEW OF THE STRAIN GAUGE.

It is pointed out that the three-inch legs allow measurements on the deepest layer of steel in four-way flat slabs, and the checkered plates reduce the strain of continued reading by improving the grip of the hands on the instrument. The trunnions of the movable leg are held up into position in the notches of the frame by a spring, guarded by a cover plate. Both the spring and the cover plate are square, with a square hole in the centre of each through which the movable leg passes. The cover plate is held in place by four counter-sunk screws, which are screwed home in the frame and thus have no tendency to work loose.

It is held that as the instrument is used only in testing buildings, the gauge length is fixed at 8 in., this length being considered most practicable for all round use. The dial can be revolved any part or all of the revolution to eliminate parallel in reading on floors, ceilings or columns, and to permit the dial end to be held in either the right or left hand. It is of interest to note that the instrument is constructed throughout of Invar steel. The dial is an Ames gauge, graduated to thousandths of an inch, and as the proportions of the movable left are one to five, the instrument therefore records strains of .0002 in. The gauge was designed by D. E Hooker and constructed for Professor Berry by F. F. Metzger, of Philadelphia.

GEARED HEAD LATHES

Lathes with geared heads for either belt or motor drive are announced by the Cisco Machine Tool Co., Cincinnati. The geared head on the belt-driven machine has a double friction countershaft, one friction running 300 r.p.m. and the other 130 r.p.m. The 300 r.p.m. friction has control of 10 spindle speeds, 300 and 200 with back gears out, 214, 146, 116, 78, 54, 36, 29, and 19 with back gears in.

The 130 r.p.m. friction has control of 10 spindle speeds, 130 and 88 with back gears out and 93, 63, 50, 34, 23, 15, 12, and 8.5 with back gears in. There are four levers, including the back gear lever, required for these changes. One handle controls the friction on the spindle and two handles control the shifting of four back gears on the eccentric shaft. A pull pin in the face gear is used to run straight from the spindle when the back gears are out. The eccentric shaft lever or back gear lever meshes back gears with spindle gears. On the spindle are a friction and six gears, on the back shaft four gears, on the drive shaft two years, all gears and spindles being of 0.40 to 0.45 carbon steel. Except the drive shaft gears, which are rawhide, all geared heads have ball bearings.

In applying the motor to the geared head a plate is placed on the top of the regular geared head with a bracket on the plate for an intermediate stud. On the intermediate stud is a rawhide intermediate gear. A pinion is placed on the motor and a gear on the drive shaft, both pinion and gear being made of steel. The gears are covered and the spindle speeds are 220 and 150 r.p.m. with back gears out and 158, 107, 86, 58, 40, 27, 21, and 14 with back gears in.

The lathes are made in four sizes, 14, 16, 18 and 24-in. For motor drive, these lathes require a 2½, 3, 5 and 7½-h.p. motor respectively. The manufacturer specifies a General Electric motor at 1,700 r.p.m. for direct current or a Westinghouse motor at 1,800 r.p.m.

A Detail Study of the Manufacture of Silica

A Complete Description of Its Analysis, Density, Porosity, Temperature, Etc., Are Contained Herein. To Those Interested in Such a Subject, This Article Should be of Keen Interest

By M. E.

THE manufacture of silica products employed in the Martin or similar furnaces is carried out with compact siliceous rocks, suitably ground, about 2 per cent. of slaked lime being then added, with sometimes a little clay or ground bauxite, and the whole is worked up into a body which can be moulded directly in metal moulds or by means of a machine press which gives sharp angles; it is not necessary to employ a powerful pressure. The pieces are afterwards dried, then carried to as high a temperature as possible in the kiln. The silica products met with in commerce can be arranged in three broad categories: (1) Those which include large grains; (2) those which include medium grains; (3) those which include small grains. These grains of rock, large or small, are all surrounded by a fine mass made by the mixture of finely ground lime and silica, forming a kind of cement adhering to the grains of rock.

Analysis of silica products can be made by two processes; either by the quantitative analysis of each of its elements, or by estimation in the state of sulphates of the elements of other than silica. In this last process, which is rapid but imperfect, the lime, alumina, etc., are treated all together, without paying attention to their proportions, but it is indispensable to know the quantity of alumina contained in these products, for, if it is in excess, it brings about a lowering of the softening and fusion points.

Physical studies of silica products comprise observations on changes of volume, density, porosity, and mechanical resistance under the influence of high temperatures. For this purpose tests are carried out: (a) On products such as proceed from factories; (b) on the same products submitted to 1,710 deg. C. for an hour or two, or to 1,650 degs. C. for the time necessary for their complete expansion.

The tests on products made by the trade include determination of density, porosity and resistance to crushing at ordinary temperature.

Density.—Apparent density and absolute density are measured; the measure of this last provides a first indication on the thermal conditions in which the product was burned. The density of quartz is about 2.66; under the action of heat, when it attains its total increase in volume the density is about 2.32. Quartzites present analogous results. The density of flint varies between 2.60 and 2.62; after burning at a high temperature this density is no more than 2.22. If, for example, this absolute density is not above 2.45 to 2.50, it is certain that the burning has neither been high enough nor long enough; if this density is below 2.40 and tends to approach 2.35, their burning can be considered satisfactory. Silica products based on compact flint present smaller absolute density, which should approach 2.25 and tend towards 2.22.

Porosity.—Porosity is determined by finding the weight of water which the very dry siliceous product absorbs during a stay of twenty-four hours in water. Porosity depends on several factors, and particularly on the nature of the rock, the size of the grains, the composition of the cement, etc. Certain bricks have a porosity of 8 per cent.; others have higher porosities, sometimes reaching 20 per cent. This porosity should increase when the products are heated to 1,710 degs. C., if they are of good quality, too great a porosity facilitates absorption of slags in the Martin furnace, and accelerates wear of the bricks.

Resistance to Crushing at Ordinary Temperatures

The resistance to crushing is very important. In Martin furnaces, and especially in the arches, the part of the products which is in contact with the gases in combustion increases in volume, the arches swell, and pressure—often very high—results in different directions. Just at the periods of tapping or of changing the furnaces there are great variations of temperature which bring about contractions or expansions. During these operations the bricks should resist changes of pressure without being crushed or cracked. The resistance to crushing at ordinary temperature is measured by the process adopted by the Conservatoire National des Arts et Metiers, where half bricks are operated on. This resistance depends on the quality of the grains of the rock, and the quality of the cement which surrounds them; it is greater when the porosity of the products is small. According to the physical properties of the products the resistance to crushing varies from 120 to 500 kilog. per sw. cm.

It is preferable to proceed with these tests on whole bricks which have been heated to 1,710 degs. This operation is performed in a Bigot and Bodin recuperating furnace. If the condition of the pieces permit, their expansion, density, porosity and resistance, to crushing tain only 85 per cent. of silica and 15 per cent. of foreign matters, are as rewhen cold and at 1,500 degs. are then determined. When taken from the recuperating furnace, if the pieces have been clearly softened and deformed, or have melted, they are of inferior quality and are not suitable for use in the Martin furnaces. Where they have resisted without either melting or being deformed three principal cases occur: (1) As the temperature is raised, the siliceous grains increase in volume and porosity. The cement which surrounds them is partially vitrified, contracts, and resists (without cracking) the expansion of the silica grains. Experience proves that the porosity of these products decreases in proportion as they are taken to higher temperatures, and that the best silica products present this peculiarity; (2) creased, their porosity has increased, and it more finely and not use large grains. In the case of Souvigny quartzite, which expands 10 per cent. and a quartzite American sandstone which expands 15 per cent., the volume of a cube of the first with side 10 becomes 1,331, at 1,710 degs., and a similar cube of the second becomes 1,520; the volume of the first gas increased 33.10 per cent., and that of the second 32 per cent. In order to obtain an equal increase of volume it would be necessary to crush the American sandstone finer than the Souvigny quartzite; (3) porosity, after heating to 1,710 degs., has slightly increased, resistance to crushing at ordinary temperature has perceptibly decreased, and resistance to crushing at 1,500 degs. has become null.

Careful examination shows that the grains of siliceous rock have become friable, the chief material employed being such as falls into powder at 1,710 degs. The porosity of these grains has increased considerably; the cement has preserved its consistency and has not cracked, but when a trial is made for resistance to crushing at 1,500 degs. the cement softens, and the grains no longer having any cohesion, the products crush under slight pressure. The quality of these products is defective; it is like those which are made with a mixture of rocks of good quality and rocks of which have become exhausted at high temperature.

The study of silica products with the microscope shows that tridymite is formed rather rapidly in the presence of lime at high temperature—this formation being much slower in the parts of rock grains which are not in contact with the lime.

It is rather difficult to state precise rules on the subject on account of the variety of the principal materials. The principal qualities required of silica products: (1) Refractoriness as high as possible and above 1,710 degs; (2) increase of volume as small as possible; (3) crushing resistance as high as possible when hot and at ordinary temperature; (4) small porosity. Attention should also be drawn to two particular points, the grinding the rock and the burning of the products.

The existing practice is to use heavy vertical mills. The ground material is

afterwards sifted in order to separate over-large grains, which are reground. The apparatus used in the sifting room allows no separation of very fine elements, fine, medium, and coarse. Vertical mills destroy part of the angles and the ground material is never of constant composition because it remains for a longer or shorter time in contact with the grinder, or because the pieces of rock to be crushed offer very variable resistances to crushing. It is certain that manufacturers will be induced, sooner or later, to make use of processes analogous to those used in the abrasives industry—crushing the rock, grinding in cylinders, a sifting which allows classification of the grains and separation of the fine dust constituting the basis of the cement which serves as agglomerant. These processes give grains with sharp edges. They allow exact determination of the proportions of grains of different sizes separated by the sifting rooms. Manufacturers will thus have the possibility of making products with angular grains, of constant composition as regards grain size, and including a known proportion of fine.

These products are burned at as high a temperature as possible, viz., about 1,600 degs., at which temperature a few hours' firing suffices in order to obtain a good result. At present most manufacturers use intermittent kilns, which only permit temperatures of about 1,400 degs. to be contained in the middle; it is necessary then to maintain the products at this temperature for long hours in order to obtain a transformation and a partial expansion of the silica; a considerable expenditure of fuel and a magnified duration of the burning result. In some of these kilns the setting in, the burning, the cooling, and the drawing from the kiln, require about three weeks.

As a result of repeated trials made in a tunnel kiln between 1,500 degs. and 1,550 degs., the duration of a good burning according to the tonnage to be produced per twenty-four hours, varies from four to five days from the moment the products enter into the tunnel until the moment they go out of it.

The examination of a number of bricks taken from open hearth furnaces shows the influence of density and porosity on crushing resistances; they give valuable indications as to the condition of the bricks in the furnaces and the essential principles which should be conserved in the management of these furnaces. It also demonstrates two very plain facts, contrary to the opinions generally approved at present, viz: (1) It is admitted that silica products are only of good quality if they include 94 to 95 per cent. of silica. But the experiments show that the grey parts of the bricks which contain only 85 per cent. of silica and 15 per cent. of foreign matter are as refractory as products with 95 per cent. of silica and that thanks to their feeble porosity they are far superior as regards crushing resistance at all temperatures; (2) It is equally admitted that an excess of lime and of iron oxide is detrimental in silica products, and that it is only necessary to exceed the proportion of 3 to 4 per cent. for these two elements combined. But in the grey part of the bricks the proportion of these two elements varies from 10 to 14 per cent.

The following table recapitulates some of the physical tests which have been made in the course of these studies:

(a) Brick of good quality.
(b) Brick which cracks at high temperature.
(c) Brick made with rocks friable at high temperature.
(d) Brick from a Martin furnace, unattacked part.
(e) Brick from a Martin furnace, brown part.
(f) Brick from a Martin furnace, grey part.

	A	B	C	D	E	F
Fusion points	1,750°	1,730°	1,730°	1,730°	1,710°	1,730°
Linear expansion at 1,710°, per cent.	1.60	5.90	4.00	2.50	....	....
Porosity (water absorbed), per cent.	12.00	9.5	10	10.5	2.1	0.3
Porosity after heating at 1,710°, per cent.	9.7	16.10	12	9	....	..
Crushing resistance at ordinary temperature	121	480	160	166	1,115	1,115
Crushing resistance at ordinary temperature after heating at 1,710°	...	nil	52	...	....	....
Crushing resistance at 1,500° after heating at 1,710°	77	nil	nil	37	52	138

The crushing resistance is expressed as kilogms. per sq. cm.

INTERNATIONAL MACHINERY EXPOSITION ANNOUNCED

Announcement of the International Machinery Exposition to be held in Grand Central Palace, New York City, has been made by the Merchants' and Manufacturers' Exchange of New York. This is to be one of the most advanced steps made in the machinery industry since the war ended, and will be a permanent affair. October 15th is scheduled as the opening date, at which time it is expected that hundreds of machines will be in actual operation on the floor. The exposition will occupy 50,000 square feet of floor space, in the high structure, which is the largest exposition building in the world and will include a most comprehensive display of modern engines, lathes, milling machinery, planers, drills, screw cutters, presses, boring, can-making, woodturning machines, etc.

The Merchants' and Manufacturers' Exchange, which operates Grand Central Palace, is owned and controlled by the Nemours Trading Corporation, of which Alfred I. duPont is president. It has nineteen branches and 3,000 selling agencies throughout the world, and is one of the most remarkable organizations of the sort in existence. The Merchants' and Manufacturers' Exchange will operate eight permanent industrial expositions in the Palace on the eight upper floors of the 12th storey building. The four lower floors will be used for temporary exhibit, such as the annual automobile show, motor boat, flower show, etc.

Visitors at the International Machinery Exposition will also find the other expositions in this building of considerable interest, included among them are the International Factory Appliance Exposition, International Mining Machinery Exposition, International Farm Tractor and Implement Exchange, and International Exposition of Mining Industries, etc. The advantages of the great world trade clearing house are obvious. Manufacturers will have their exhibits side by side, affording easy comparison. Interchange of ideas and the opportunity to observe what is new and improved in machinery, will be of decided benefit to all who are connected with the industry. Then, too, familiarity with the implements and machinery of one industry so often leads to appreciation of their applicability to another.

Lloyd L. Warfield is manager of the Machinery Exposition and will be assisted by an able staff. Fred W. Payne is general manager of the Merchants' and Manufacturers' Exchange, and has general supervision of all of the expositions. Inquiries should be addressed prior to Sept. 15th to Suite 421, 405 Lexington Ave., New York City, and after that date to Grand Central Palace.

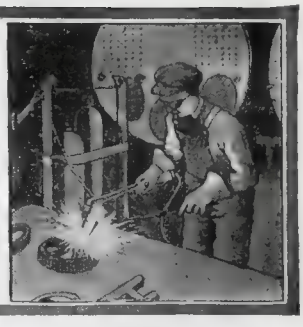
Three fires started in a large grain elevator recently within 5 ft. of each other, at intervals of one hour. Experiments by electricians developed the fact that the fires were caused by wheat dust collecting on a 16 candle-power, 55-volt, ordinary incandescent lamp. The dust ignited from the heat from the globe, fell to the floor and ignited litter lying there. Further experiments showed that the defect may be entirely corrected by the installation of double globes, or, in other words, encasing an ordinary globe within a thin glass covering. This modifies sufficiently the intensity of the heat, but does not reduce the light.

Of the total output of crucible and electric steel in Germany, for 1917, 349,480 tons, 62 per cent. was produced in the electric furnace. One-third of this quantity was produced in induction furnaces and two-thirds in arc furnaces, the induction furnace apparently being preferred by the works producing high-quality steel. The average capacity of the electric furnaces built in Germany during the war was 6.7 tons. The figures for Austria-Hungary, which, much lower, show sensibly the same ratios, except that two-thirds of the electric output was obtained from induction furnaces.

As apprentices progress in their work they often find themselves in need of such tools as scales, micrometers, dividers, centering devices, and so on, but without the funds to provide them. One of the foremen in the Scovill Manufacturing Company's plant, realizing this, has adopted a method whereby these tools may be easily supplied. Each worker gives him 50 cents a week. As they at different times come in need of a certain tool, it is purchased with the money.

This instils in the boys the saving habit and helps them provide themselves with a set of high-grade tools.

WELDING AND CUTTING



Welding Jigs and How to Overcome Distortion

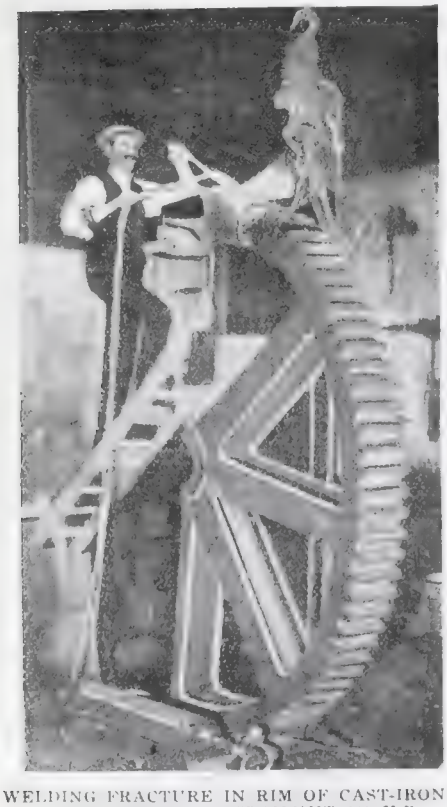
The Subject of Welding Jigs, and Various Methods for Overcoming Distortion as Presented by a Paper Read at a General Meeting of the British Acetylene and Welding Association

By C. S. MILNE

(Continued from August 14th Issue)

With regard to Mr. Metcalf's point concerning the rubber tubes in the machine in Fig. 31, these should not get entangled, as the machine is turned back to its original position after each cut; this unwinds the tubes again.

In reply to Mr. Pickett, Mr. Milne said: Much research into the welding of copper has been made recently. If one uses pure electrolytic copper one gets in the weld a large amount of copper oxide, due to oxidization during welding, but by using copper rod for filling in, which has a very small proportion of phosphorus in it, one eliminates the oxide and one gets a thoroughly sound joint. The great trouble is the large expansion of copper. Whether pure cupper or phosphor is used, it is very weak at high temperatures, and if you get any strain on it before it get down to a fairly low temperature, the weld or metal adjacent to the weld will crack as concentration takes place.



WELDING FRACTURE IN RIM OF CAST-IRON GEAR WHEEL TO TRANSMIT 210 H.P.

The only thing to do is to try to find some method of relieving the strains until it has cooled, but in most cases of repair work, particularly in flat surfaces, it is very nearly impossible to do that. Copper welds can be made, and are frequently made in new work, and, when one cuts through a section of them and makes a microscopical examination or analytical test, one finds the weld absolutely sound, the trouble is that copper has little strength while hot to stand contraction.

Mr. Gardner asked whether I made allowance for contraction in welding by means of my machine. Well, I did not. In this case (Fig. 29) there is a seam right round the article, and when you are welding it you have got to tack in a few places to hold it together. You may have trunnions to swing it on, but whatever you do it is impossible to make any allowance for contraction whether the work be done by hand or by machine. In the machine I intended to tack in three places to hold the parts together and the contraction would have had to look after itself. The bomb ends being more or less hemispherical in shape, would give somewhat to this contraction.

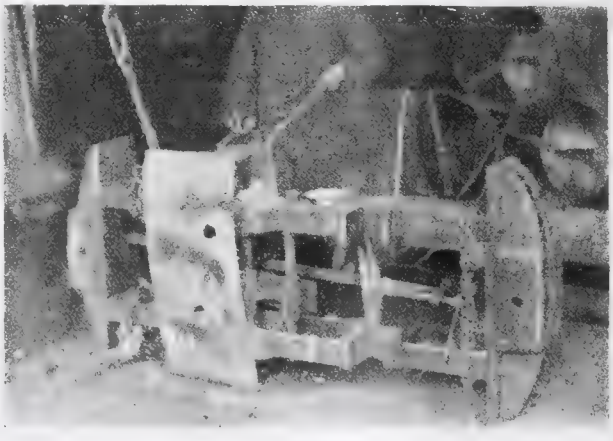


FIG. 35.

Mr. Hoddle asked whether my welding machine will be perfected. I do not suppose my bomb welding machine will ever be perfected, but I am hoping shortly to resume my investigations in regard to a machine which will be suitable for welding longitudinal or circumferential seams in such things as barrels and jacketted pans, etc., and I hope in six months time I shall be able to go to Mr. Hoddle and say I have got a machine to sell him.

Mr. Thomson remarked that I had not shown any examples of welding motor parts, I thought the motor side of this business had been done to death. If Mr. Thomson cares to come down to my works any day I shall be glad to show him anything from half a dozen to a couple of dozen cylinders in the process of repair. Our method of repairing a cracked cylinder head is to cut a piece

out of the jacket so that we can get at the head to weld and afterwards replace and re-weld the jacket, when cold we test it with water pressure; we then send it back to the owner as good as ever it was.

My thanks are due to our president, Mr. Jackson, for the great assistance he rendered in trimming up some of my sentences. I also wish to thank Mr. Hoddle for the kind loan of a lantern which was of great assistance in producing satisfactory slides.

The president in conclusion said: There is only one more word to be added, and that is to thank Mr. Milne for all that he has done and for all that we must have gained by out attention here to-night. I would just add that, as Mr. Milne is a member of the association, I shall not ask you to pass a formal vote of thanks, because he feels that he has only done his duty in giving us this information to-night.

The company then inspected the apparatus which Mr. Milne had brought for the benefit of the association.

Production Speed on Oxy-Acetylene Cutting

Here is an Answer to the Numerous Papers, Written on War Applications to the Oxy-Acetylene Process. This Was Presented at the Annual Convention of International Acetylene Association at New York

By R. R. BROWNING, Vice-President Oxweld Acetylene Co., Chicago

DURING the course of this victory convention, we have listened or will listen to a number of excellent papers on war applications of the oxy-acetylene welding process. These articles, as well as the large number which have appeared in trade papers, including our own official organ, "The Acetylene Journal," are of the greatest interest to those in the industry, proving, as they do, the wonderful development of the process in the field of production.

The majority of these articles deal principally with welding applications, and the very important part which oxy-acetylene cutting took in war work has been given little or no attention. This neglect is not intentional, but is due to the fact that oxy-acetylene cutting so naturally fitted into war production that even those who used it hardly gave it proper credit.

Business men in this country knew early in 1916 that production of war material would have to be speeded up to meet the demands of the Allies. This speeding up process was general throughout all essential industries, and the value of the oxy-acetylene cutting process, always in the first ranks as a time and money-saver, commenced to be recognized more thoroughly as a necessary part of the production system.

The demand for steel of all kinds to be used in shells, ships, guns, artillery, etc., became tremendous, with the logical result that scrap metal was required by thousands of tons. The use of the oxy-acetylene cutting process in wrecking old boilers, ships, tanks, etc., for steel scrap, increased to such a point that portable outfits were carried to most inaccessible places in country districts, the process applied, and charging box steel scrap produced for shipment to the mills. It truthfully can be stated that without the oxy-acetylene cutting process the scrap market would have been in an absolute panic to supply the tremendous tonnage demanded.

With the inauguration of submarine warfare by Germany, it became immediately apparent to the American shipbuilding industry that steel ships without number would be required. The oxy-acetylene cutting process, which since its introduction into this country has been used by the steel ship builder, was one of the first processes to be called upon to speed up production in old, as well as in new, shipyards. The development of the applications in the shipyards occasioned by the demand for more ships was a matter given special attention by the Welding Committee of the United States Emergency Fleet Corporation, by the American Bureau of Shipping and by Lloyd's. The result was the application of the process to such important work as the following:

Cutting or trimming of plates and structural iron to shape.

Making man-holes, portholes, patches, ventilator and funnel openings, stairway openings, mast openings and headlights.

Trimming stem and stern posts.

Cutting frames and "between rib" plates.

Cutting shafting, pipes, chains, rivets and scrap.

The majority of these applications were made absolutely essential during the war in the speed-up schedule required through the time limit placed on production, a most interesting example being that of cutting portholes.

It has always been customary in shipyards to punch a large number of holes with a ½ inch or ¾ inch punch around the periphery of the proposed porthole. The central portion or plate was in this manner removed and the edges then trimmed by means of a chipping hammer. An average of one and a half hours was required to make in this manner a 12 inch diameter porthole, whereas with an oxy-acetylene circular cutting blow pipe and a simple attachment, the portholes were, during the war, and are now, completed in an average time of five minutes each. This not only shows a considerable saving in time and cost in doing the work, but it can also be said that the finished porthole, as made by the oxy-acetylene cutting process, is better in appearance than that of the older process.

The process had been for years applied to the cutting of armor plate, but during the war the increased efficiency of heavy ordnance made it absolutely essential to increase the thickness of armor plate used on battleships and coast defenses. The oxy-acetylene process took care of this increased cutting limit in many instances in the manufacture of new armor plate. As a result of the change of armor plate construction made necessary by the war, Government proving grounds such as that conducted at Aberdeen, Md., were called upon to test, seemingly without limit, all kinds of armor plate. After this plate had been hit by several shells it was, of course, only suitable for further use as scrap. The question, however, was to reduce it to handling size, so that it could be remelted. A specific example of this can be quoted from work done at the Pittsburgh Crucible Steel Co., Midland, Pa., where thousands of tons of this scrap armor plate, averaging 16 to 17½ inches in thickness, was cut by the oxy-acetylene process. Working cost showed the actual cutting of this material at the very low figure of 1 3-10c per sq. in. and the wonderful speed of 3 lineal inches cut per minute. This speed is the more remarkable when one stops to consider the high percentage of chrome and nickel contained in armor plate.

Shortly after the United States took up arms against Germany, contracts were placed with numerous steel foundries throughout the country for castings to be used in the construction of naval and field guns. One of these castings, called the gun slide, is most difficult to manufacture. It has a trunnion or projection of metal on each side, which is very heavy compared to the walls of the casting and in order to eliminate shrinkage and cracking when the casting cools, the trunnion has to be carried clear across the casting. After the casting is cooled that part of the trunnion that passes the bore of the casting in which the gun rides has to be removed, and as the bore is circular, about 12 or 14 inches in diameter, varying with the size of the gun, to remove this part by machine would be very slow and costly, so that a number of foundries used to splendid advantage the Staybolt oxy-acetylene cutting blow pipe for removing the surplus metal. Such companies as the Superior Steel Casting Co., West Steel Casting Co., the Linderman Steel

Machinery Co., and the McCord Co., used the process, securing a good, smooth cut without injury to the walls. The time saving as compared with older methods was a tremendous factor in the speed of production.

Essential applications of the character already given might be continued without number, such as the application made by the Illinois Steel Co., of South Chicago, in cutting torpedo heads by means of the blow pipe, or of the work done by the Radiograph and the Oxygraph in cutting irregular steel shapes, but further remarks in the paper will be confined to what was probably the greatest example of the application of oxy-acetylene cutting made during the war, namely, the nicking of steel bars for the producing of shrapnel and high explosives or gas shell cases.

Long before the armistice was signed, many large plants in this country were engaged, in whole or part, in the making of shell cases, and the final overwhelming superiority of the Allies was undoubtedly due to the unlimited supply of artillery ammunition. It is a well-known army saying that "He who has the better artillery wins the battle," and especially was this true in the world war.

The United States Government had for some years made shells of various sizes in some of its arsenals, and, in addition, a few large steel companies, such as Bethlehem and Midvale, had ordnance departments previous to the war. When the appeals and orders from France, England, Russia, etc., commenced to reach the steel and forge men of America, a mighty upheaval took place. Large plants in all sections of the country turned from making bolts, nuts, air brakes, cans, machinery, etc., to the more urgent necessity, shells.

In the making of steel shell cases it had always been customary to take the long bars of shell steel as they come from the rolling mills, and by means of power driven saws, with teeth of high speed steel, cut them into billets or slugs so that the forging might then be made, the machining accomplished and the shell case assembled into the finished death carrying shrapnel.

Such companies as first entered into this new work during the years 1916 and 1917, for example, National Tube Co., McKeesport, Pa.; Bartlett-Hayward Co., Baltimore, Md.; Barney & Smith Co., Dayton, Ohio; Milton Mfg. Co., Milton, Pa.; Tennessee Coal Iron & Railroad Co., Birmingham, Alabama, realized immediately that if the tremendous production asked for was to be obtained that some other method of cutting bars and billets would have to be found which could be easily and quickly applied and which would be so fast that the big forging presses would not be idle a moment for lack of slugs.

Oxy-acetylene cutting just naturally filled the gap as no other method could, and the wonderful production figures as given below were attained in the majority of the hundred or more plants engaged in this work.

Hot saw or friction saw nicks gave

Diam. of bar. Inches.	Billets per 8-hour day per operator.	Average depth of nick.	Aver. cost per 8 hr. of nicking, including gases, labor and breaking.
3 2-10	2000	1/4 inch	1.55 cents
5 3/8	800	3/4 inch	4.8 cents
9	250	3/4 inch	7.5 cents
11 1/4	100	1 inch	20 cents

only about one-quarter of these production figures, while the cost was more than double that of the oxy-acetylene method. It was also found that nicks made by the oxy-acetylene method doubled the number of good breaks as compared with that of the saw method. In addition, nicks made by means of saws did not break as close to the vertical plane or with as good a fracture as the bars nicked by the oxy-acetylene method. These two latter points were of special interest to the manufacturer, first because with the clean break the forgemen were enabled to place the billet directly into the die as it came from the breaking press or hammer and without difficulty centre the piercing punch, and secondly through the securing of a clean fracture inspection of the steel by Government employees was greatly facilitated.

When the process was first applied for the nicking of steel bars, the groove or nick was made to considerable depth and over the entire circumference of the bar. As time went by and the knowledge of experience was secured, the nicking depth was decreased and the cut was made usually over one-third of the circumference. No additional weight or power in the hammer or breaking press seemed to be necessary, and the breaks were even better than when the whole circumference had been nicked. The increase in speed and the decrease in costs were, of course, items of interest, especially to the larger manufacturers, where production of twenty-five to thirty thousand slugs per day was maintained as an average. Naturally various methods of holding the hand, or machine type, cutting torches used in this application were originated by the various users. Many of these devices were unique, but the majority were simple in character and made provision primarily for the holding and position adjustment of the blow pipe.

The majority of the installations consisted of Duplex Acetylene Generator, oxygen manifold, and the requisite number of hand or machine type cutting stations to give the production required.

The process was also applied in some cases to the trimming of the shell edge after machining of the outer and inner surfaces, thereby increasing the speed of this operation as compared with the ordinary cutting off tool in the lathe by over 50 per cent. A similar application was also made of removing the nubbin or small end remaining at the nose of the shell case after machining in the lathe had been completed.

During 1917 and 1918 many large concerns took up the manufacture of shells, and practically without exception the oxy-acetylene nicking process was used to secure the large production demanded in their contracts. More prominent among those who did work of this character are the following:

New York Air Brake Co., Watertown, N. Y.

American Can Co., Edgewater, N.J.

American Steel Foundries, Chicago.

Milton Manufacturing Co., Milton, Pa.

National Tube Co., McKeesport, Pa.

Twin City Forge and Foundry Co., Stillwater, Minn.

Worthington Pump and Machine Co., Jeansville, Pa.

Pennsylvania Seaboard Steel Co., New Haven, Ct.

American Motor Truck Co., Newark, Ohio.

Bartlett-Hayward Co., Baltimore, Md.

Hewitt Steel Co., Newark, N.J.

Tennessee Coal, Iron and Railroad Co., Birmingham, Ala.

Cleveland Crane & Engineering Co., Wickliffe, Ohio.

Williams, White & Co., Moline, Ill.

American Rolling Mill Co., Middletown, Ohio.

William Wharton, Jr., Co., Easton, Pa.

Ingersoll-Rand Co., Phillipsburg, N.J.

Crucible Steel Co., Harrison, N.J.

Central Steel Co., Massillon, Ohio.

Detroit Steel Castings Co., Detroit, Mich.

Standard Forgings Co., Indiana Harbor, Mich.

Bethlehem Steel Co., Steelton, Pa.

Barney & Smith Co., Dayton, Ohio.

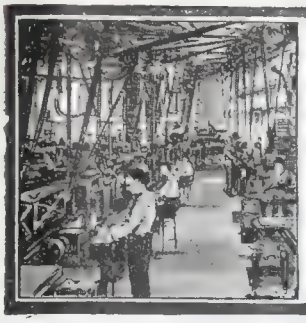
Curtis Manufacturing Co., St. Louis, Mo.

American Tube & Stamping Co., Bridgeport, Ct.

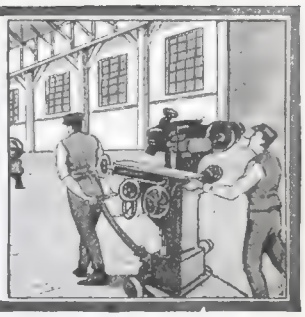
Laconia Car Works, Laconia, N.H.

E. W. Bliss & Co., Brooklyn, N.Y.

Reference has been made in this paper only to the application in production work, but we must not forget the thousands of applications which were made in the maintenance of plant equipment in conjunction with the oxy-acetylene welding process, thereby keeping producing equipment at top-notch speed. The further use of the process in such special applications as the cutting of steel lake steamers into two sections so that they might be passed through the Welland canal on their way to the ocean to do their bit in carrying the boys across to France, the application made by the English in removing sections of submarines or other vessels in order to allow the release of imprisoned persons, and it is further rumored that the Germans used the oxy-acetylene cutting process in the destroying of artillery which they had to leave behind in their flight. Can we not, therefore, in true justification, state that the oxy-acetylene cutting process must be, and is, recognized as one of the decisive factors in the winning of the war?



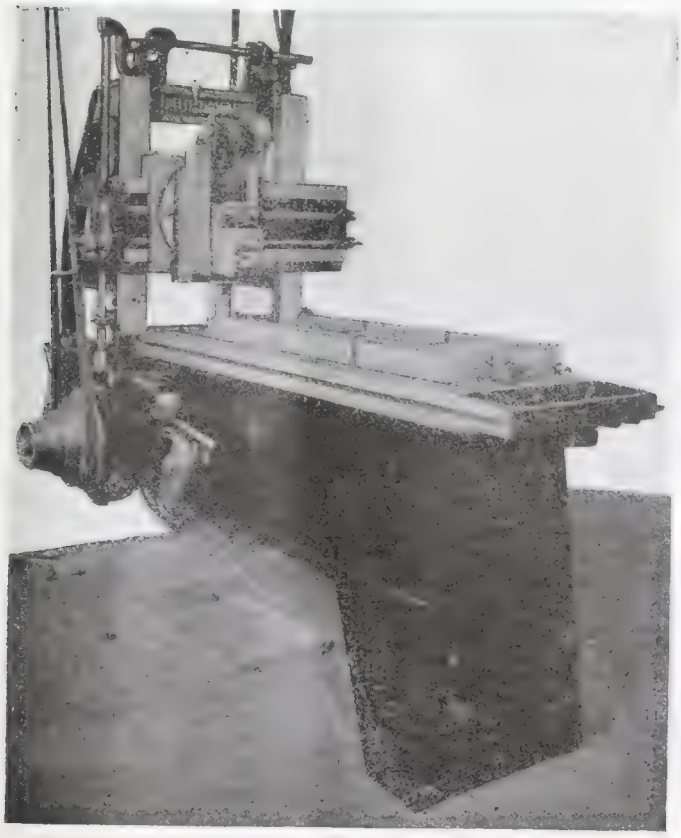
DEVELOPMENTS IN SHOP EQUIPMENT



MULTIPLEX MACHINE TOOL

FOR handling repair work in power plants, engine rooms, or on board ship, and to meet the requirements of general repair shops and garages, the Multiplex Tool Co., Inc., 76 S. Eighth St., Brooklyn, N. Y., has developed what is known as a "universal" machine tool which provides for the performance of those classes of work that are ordinarily performed on planers, lathes, horizontal and vertical boring machines, slotters, milling machines, drilling machines, and gear-cutting machines. From the accompanying illustrations, it will be apparent that so far as its general appearance goes, the design of this machine is more nearly like that of a planer than of any other standard tool. At the right-hand side, there is the usual planer driving mechanism, with forward and reverse belts and means of obtaining the required feed movement of the tool. As this part of the machine does not represent an important departure from standard practice in designing, the following description will be concerned chiefly with the mechanism at the left-hand side of the machine, from which power is taken for driving all of the different attachments that provide for performing the various operations on this machine. A detailed description will also be given of each of these attachments.

Before starting to give an explanation of the way in which the different members of this universal machine tool function, it will doubtless be desirable to make a general statement of means which are provided for the performance of lathe work, horizontal and vertical boring, milling, drilling, slotting, and gear-cutting operations. In order to do so, attention is first directed to the driving pulley at the left-hand side of the machine. From the shaft that carries this pulley, power is transmitted through bevel gears to a vertical shaft running up beside the housing. There are two bevel gears at the lower end of the vertical shaft, each of which meshes with a bevel gear on the pulley shaft. By means of lever on side of machine, provision is made for clutching either of these gears to the shaft in order to drive it in a forward or reverse direction. Through a pair of spiral gears, this vertical shaft transmits power to a horizontal splined shaft in the cross-rail, which transmits power through bevel gears to a vertical spindle mounted in bearings in the planer head. The small level shown provides for the manipulation of a clutch by means of which either of two bevel gears may be secured to the vertical spindle to provide for driving it in a forward or reverse direction. This vertical spindle is made with a tapered socket in which milling cutters or twist drills may be mounted, using an adapter bushing if necessary, or a gear furnished with a tapered shank to fit the socket may be mounted at the lower end of this spindle in order to provide means of driving the lathe head or the horizontal boring head.



ROUGHING OUT A SADDLE ON THIS MACHINE.

For the performance of slotting operations, a special attachment is permanently secured to the right-hand side of the planer head, power for driving this attachment being transmitted from the vertical spindle through a pair of spiral gears to a horizontal shaft that carries a slotted crank disk, in which the position of the crankpin may be adjusted to provide for obtaining any required length of stroke for the slotting tool. For vertical boring, a rotary work-table is provided, which is driven from a spiral gear that can be seen on the vertical driving shaft at the left-hand side of the machine. From this gear, power is transmitted through a horizontal shaft that is carried by a bracket bolted to the face of the housing, and thence through bevel gears to another horizontal shaft on which there is a worm that meshes with a worm-wheel connected to the rotary table. It will, of course, be apparent that in connection with this rotary attachment, use is made of a tool mounted in either the vertical spindle or clapper-box of the planer head, according to which is most convenient for the particular job on which the machine is engaged.

Lathe Headstock and Tailstock

The lathe head is driven by a bevel pinion carried on a tapered shank which fits into the vertical spindle of the machine. This pinion meshes with a bevel gear on the lathe head, and it will be seen that back-gears are furnished, as in the case of engine lathe heads of standard design. There are also studs at the end of the head on which the necessary combinations of change-gears may be mounted to provide for the performance of a wide range of thread cutting operations. Such operations are handled with the work mounted on centres; and to provide for traversing the tool along the work, use is made of a combination cross-slide and longitudinal slide that is mounted on the main table of the machine between the headstock and tailstock. Longitudinal movement of this slide is

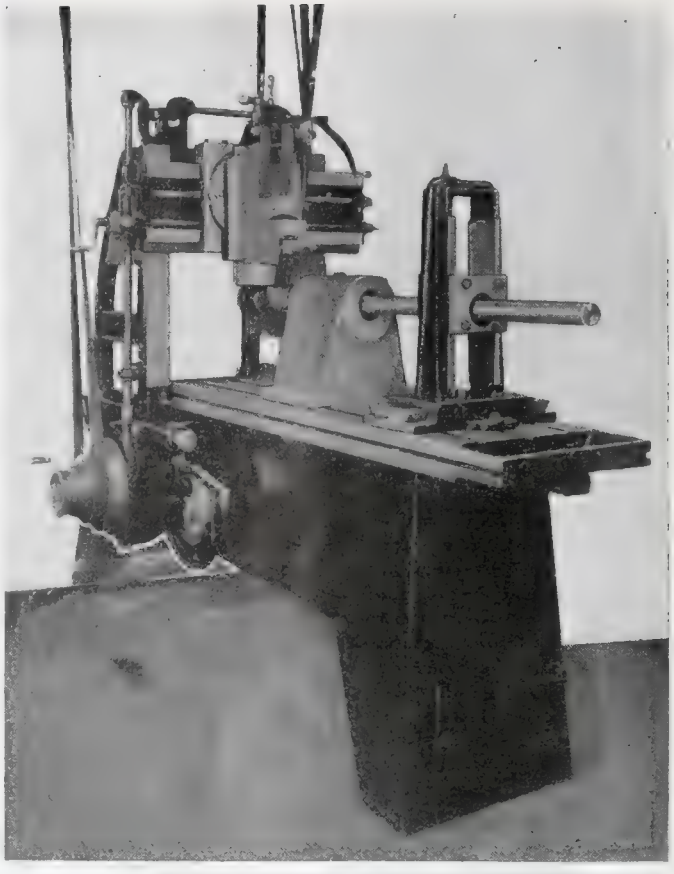
accomplished by means of a lead-screw which is rotated from the lathe head by means of a universal pointed rod.

In addition to its use for thread cutting, the lathe attachment can be utilized for the performance of various turning and facing operations; also, there is a dividing head mounted on this attachment which provides for the performance of gear-cutting operations and for such work as milling the sides of hexagonal and similarly shaped pieces. Almost any work for which a dividing head would ordinarily be employed can be done on this attachment. For gear cutting, the blank is chucked on the lathe into the tapered socket of the machine spindle. Then the traverse movement of the planer table is used to feed the work past the cutter. When the cut has been taken, the table is returned to the starting point and the work is indexed, using the dividing head to obtain the necessary spacing, after which a second tooth is cut. This process is repeated until all of the teeth have been completed.

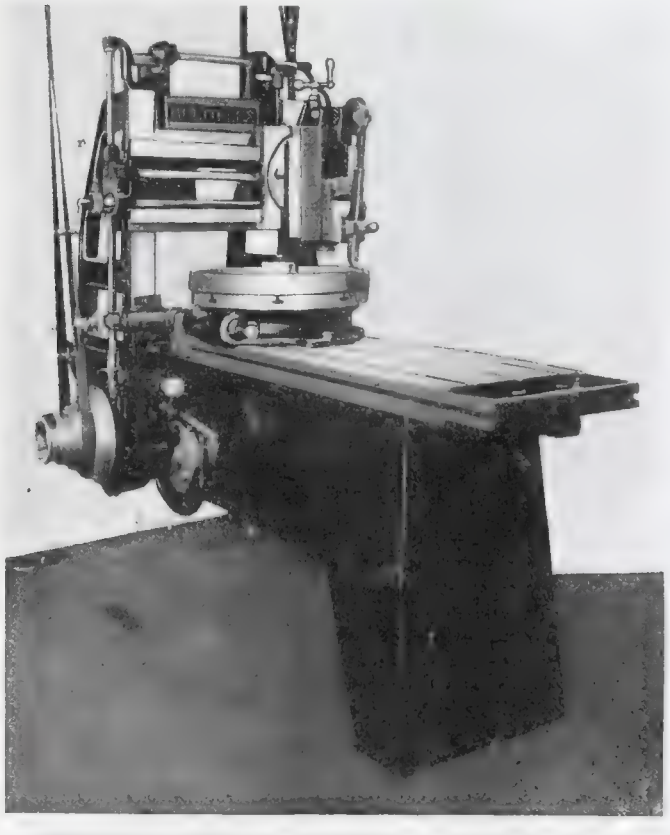
Horizontal and Vertical Boring Operations

For use in performing horizontal boring operations, there is an auxiliary attachment which is bolted onto the bottom of the planer head, provision being made for driving the horizontal spindle of the boring attachment by means of a bevel pinion carried by a shank which is fitted into the socket of the spindle carried by the planer head. This pinion meshes with a bevel gear on the horizontal spindle of the boring attachment, in which any required form of boring-bar, twist drill, or other tool may be mounted. Where a boring-bar of considerable length is to be utilized, an out-board support must be provided, and on the Multiplex machine this is furnished by a steadyrest having a bearing of the proper size to receive the outer end of the boring-bar.

In the kind of shops where the Multiplex machine is likely to be used, it will frequently be found necessary to handle such work as boring out a bearing and facing both ends of the bearing housing at accurate right angles with the bore. Such work may be done very nicely by means of this horizontal boring attachment. After the bore has been finished, a facing tool is mounted in the horizontal spindle and one end of the work is faced off. In order to assure having both of the end faces at accurate right angles with the bore, care must be taken not to disturb the setting of the work until the job is finished. Hence, the method of procedure is to raise the cross-rail and run the planer table through to a position where the opposite end of the work can be reached. Then the horizontal boring attachment is reversed, end for end, to enable the facing tool to complete the job by finishing the opposite end of the casting.



HORIZONTAL BORING NOTE THE TABLE IS FEEDING AGAINST THE CUTTER.



HORIZONTAL TURNING FINISHING A GEAR BLANK ON ITS OUTSIDE DIAMETER.

Vertical boring operations are performed on the Multiplex machine through the use of a rotary table on which the work is carried. The means that have been provided for driving this attachment have already been described. The rotary table may be used for the performance of vertical boring operations done with a tool carried by the clapper-box, or use may be made of an end-mill mounted in the main spindle of the machine. Ingenious mechanics will find many ways of using this equipment for handling the great variety of work that comes to the average jobbing shop, for the performance of which several different machine tools would otherwise be required.

Milling and Drilling Operations

Either milling or drilling operations are performed with an end-mill or twist drill mounted in the main spindle carried by the planer head. An important feature of the design, in so far as the performance of these two classes of operation is concerned, is that the planer head is mounted on a gradual swivel so that the spindle carried by it may be set at any required angle for performing milling or drilling operations in other than a vertical position. Any point can be reached around a complete circle. Power cross-fed and longitudinal feed movements are provided for the performance of milling operations; the transverse feed is accomplished by means of a screw in the cross-rail of the machine, which traverses the head along the rail; and for the longitudinal feed movement, the bull wheel and rack are driven at a slow speed in order to

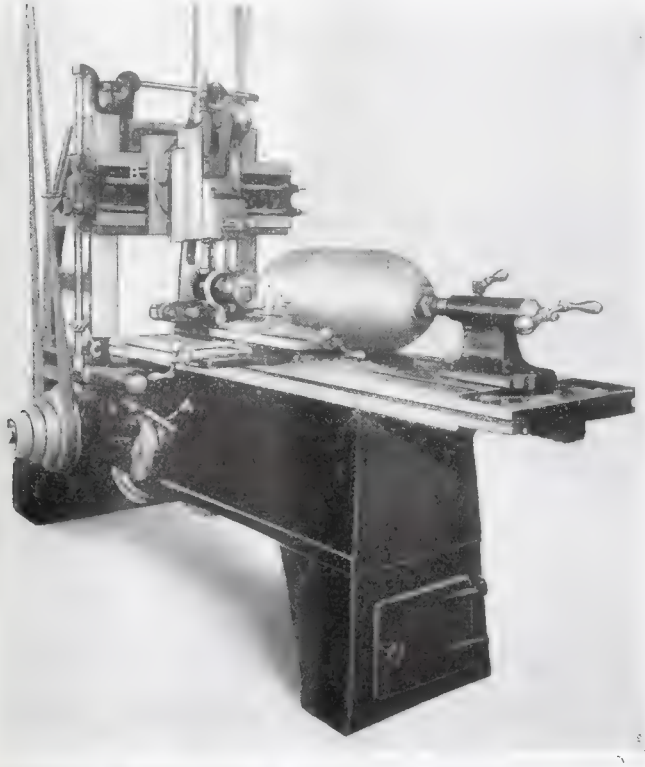
feed the table along the bed of the machine at the proper rate. This feed movement is obtained by driving the bull wheel at a low speed through a universal jointed rod, which takes power from the driving pulley at the left-hand side of the machine. On both the longitudinal feed and cross-feed movements, friction clutches are provided, and if so desired, these clutches may be released by simply turning a knurled sleeve, after which a hand-crank may be used for obtaining a rapid traverse or quick adjustment, according to the conditions of operation that are needed.

Slotting Attachment

A description has already been given of the arrangement of the slotting attachment, but attention should be drawn to the fact that the graduated swivel, on which the main head of the machine is mounted, provides for swiveling the slotting attachment so that it may be used for cutting die openings to obtain the required clearance, or for the performance of keyseating or slotting operations in tapered openings, etc.

Adaptability

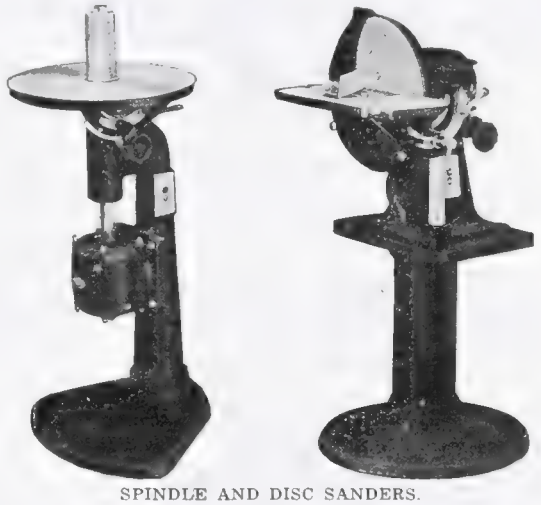
With a machine of this type, there are very few among the great variety of shops which come to a shop engaged in the performance of general machine work, which cannot be handled; and it will be of interest to note in this connection, that any of the attachments provided for use on this machine can be set up in not over fifteen minutes. One of the most important claims made for this Multiplex machine tool is that it is able to handle all of the operations which have been mentioned, without occupying any more than would be required to set up a small-sized planer. Any combination of operations can be performed on a piece of work without requiring its setting on the tables to be altered. This is often an important feature in assuring accuracy in combination boring and facing operations, etc.



TURNING BRASS STUDS ON AN 11-INCH MORTAR SHELL.

SANDERS NOW MADE IN CANADA

THE Canadian Sander Mfg. Co. have equipped a plant at Brockville, Ont., for the production of disc and spindle sanders, they having secured the Canadian rights of the Syracuse Sander Co. Plans have been made to cover the Canadian market thoroughly with these maximum time-savers. The field not only includes pattern



SPINDLE AND DISC SANDERS.

shops but woodworking concerns of all kinds and those institutions where instruction is given in pattern-making and woodworking.

The Sanders are portable, have direct motor drive and are equipped with ball bearings. They are guaranteed for one year against electrical and mechanical defects, can be plugged into any lamp socket and are very easily moved about in the shop. The disc sander has a 15″ disc, table 8″ x 20″; table is 38″ from the floor, tilts 45 degrees downward and 15 degrees upward; weight, 350 pounds; speed, 1,725 revolutions per minute. A vacuum system collects 90% of the dust. The same description applies to the spindle sander. The table is 20″ in diameter, there is absolutely no vibration, weight 200 pounds; oscillating movement 1⅛″; rolls 2″ x 9″ and 3″ x 9″. The equipment of the disc sander includes one motor, one extra metal disc, six garnet discs, half gallon cement, gauges, and six centre points. The spindle machine equipment includes a motor, two rolls and a half gallon of cement

The plant at Brockville is located in the building formerly occupied by the McArthur Belting Co., the latter having recently moved to the Halls, Limited, building.

Motor vehicles are used extensively for war purposes, but they have not entirely displaced horses. According to a statement by the British Premier, Lloyd George, the British alone employ 2,000,000 horses in their armies. 5,000,000 horses and mules are in service on the West front. Many a ship-load of mules and horses has gone from this side across the "pond" to the allies in France and England.

During their recent raids on Paris the German aviators were greatly disconcerted by rockets which the French sent up and which discharged, before dropping, parachutes with brightly burning fuses. These parachutes dropped slowly and their fuses cast a brilliant glare upon the hostile airplanes, making them a good target for the anti-aircraft guns. It is a safe guess that the free fireworks were not enjoyed by the Germans.

The MacLean Publishing Company
LIMITED
(ESTABLISHED 1888)
JOHN BAYNE MACLEAN, President. H. T. HUNTER, Vice-President
H. V. TYRRELL, General Manager.
PUBLISHERS OF

CANADIAN MACHINERY
AND MANUFACTURING NEWS

A weekly journal devoted to the machinery and manufacturing interests.

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J. H. MOORE.

Office of Publication, 143-153 University Avenue, Toronto, Ontario.

Vol. XXII. TORONTO, August 28, 1919 No. 9

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OUR readers, and particularly those personally acquainted with Col. J. B. Maclean, President of the Maclean Publishing Co., will learn with deep regret and heartfelt sympathy of the sudden death on August 17, of his son and only child Hector, aged sixteen years.

Hector was on a camping trip with Upper Canada College boys and was taken suddenly ill with acute indigestion. He was rushed in to Temiskaming, where medical attention was secured, but they were unable to save his life.

The Exchange Rate

THE why and the wherefore of the exchange rate on money passing from this country to United States, or the other way, is not clearly understood by many. As far as this country is concerned, it simply means that we have bought too much from United States, in proportion to our sales to them, and the balance is enormously against us.

But apart from that the thing is being abused, and it does not work out fairly even in this country. In the larger centres, where banks are plentiful and easy of access, the exchange rate can be secured for any American money that one may have. There are other places, though, where dealers regard American money as not one whit better than Canadian, especially when it is coming their way, although it is worthy of notice that very seldom does any of the American currency get handed out in the way of change.

United States is not in an enviable position by reason of the rate of exchange which it is able to declare against the money of the world. The Italian lire, the French franc, the British pound sterling, the Canadian dollar—they have all been discounted and set back severely in United States markets. It simply means that the purchasing power of all this currency is severely discriminated against in the U.S. markets. There is nothing new or startling in the situation, as history will show, if one cares to go back a few years to the American Civil War, that their dollar on this side of the line was regarded as being worth only sixty cents, a discount more severe than has been put on the currency of any Allied country in the markets of United States.

The rapidity with which the exchange rate changes is something that causes no small amount of worry. For instance, one day the British pound, which should be worth $4.86⅝, brings in New York $4.19¾, while on the very next day it is slated at $4.12¼.

The most natural thing in the world is that the nations whose money is at a discount should seek to avoid making any more purchases than they can help in the market where the discount exists. Nations are the same as individuals, and that is the course the individual would pursue. Were he to find that his dollar was being pruned by five cents at a certain store he would look elsewhere, and he would buy at that store only when circumstances made it necessary that he should do so. That is the very thing that is happening in United States. Their exports are falling off, and as the rate of exchange becomes more severe, or even sustained, they will continue to fall off. It certainly is not to the advantage of United States to have the purchasing medium of its customers at a discount and it is a condition that, in the long run, hurts many and benefits few.

There should be no barrier in the way of adjusting this matter. It is the veriest nonsense to tell us that a Canadian dollar, because it is spent in New York, is only worth 95 cents, and there are plenty of places where they will credit only 90 cents against it. That Canadian dollar has security behind it second to none. Likewise it is fallacy to say that a British pound is worth only some $4.12 or $4.19, as the fluctuations of the day may indicate. A British pound is worth $4.86⅝, no matter whether it is offered as payment in New York, London or Toronto. It has value behind it, and it is tough business that it should be discounted because the British nation was up to its neck in fighting the battles of the world, and had to import and import to keep going, regardless of any such puny peace-time matters as balance of trade.

The Governments of the Allied countries should get together on this matter and straighten it out. It is to the benefit of United States that it should be done, and done quickly. The exchange drives trade away. It does not attract it.

THE peace treaty having been duly signed, the anti-Bolshevik forces have proceeded to boot the Bolshevik out of Odessa.

* * *

SPEAKING of hardy perennials and annuals of all sorts, the chap who bobs up each year at the fall fair to guess your weight within three pounds easily heads the list.

* * *

THE German mark is so severely discounted now that it pays European firms handsomely to do their purchasing in Germany. In other words, they can make quite a big mark with the little German mark.

* * *

THE Prince of Wales, while in Toronto for a couple of days, shook hands with some 4,000 people, attended 'steen banquets and about 17 other functions. He had to smile under all sorts of conditions, stand when any person would want to sit, and be cheerful to prunes and good fellows alike. To say the least that's not our idea of having a real honest-to-goodness pleasant time.

* * *

CARUSO has an offer to go and sing in Mexico at $10,000 per night. Without going to the extent of disclosing names we know of several folks who will holler themselves hoarse for a whole month for that figure.

Upward Trend of Steel

ACCORDING to reports reaching here from the steel centres of United States there is a serious situation facing that industry just now. It is not that they have no business or poor bookings. The very reverse is the condition. They have a tremendous amount of business on hand. In some lines the mills have practically withdrawn from the market, as they have more on their books than they can handle.

Labor trouble has not hurt the steel industry of United States very much this year. We may have imagined that all the labor trouble there was on this continent had camped in the cities of Canada, particularly Winnipeg and Toronto, and so far this is probably fairly correct.

Labor troubles threaten to grip the steel industry now in an effort to unionize it, a feat which has heretofore been unsuccessful, although several times attempted. Such a step will touch practically the whole steel industry of United States.

Were this to happen it would mean an almost instantaneous shutting off of certain supplies as the warehouses are not heavily stocked in many places. It would also result undoubtedly in a stiffening of prices because there would be only a very limited supply of material to go around a great many pressing calls.

It is hard to see where lower levels of steel can be looked for at present. Indications are in the opposite direction. This paper is not an apostle or an advocate of higher values, but there are circumstances now that seem to point to higher steel prices before very long. Right in this province there are indications of this. One contract for bars was offered to the rollers at their old price, and it was a nice straight run in good lengths, but the mills turned it down, being booked up and not at all anxious for more business at present figures. Warehouses in several cases are in the market replenishing stocks, doing so because they have figured it out that buying now is good business, and they are out to protect themselves as well as their trade.

The Value of the Exhibition

TORONTO Exhibition has grown well and grown largely, but that building decorated with the name "Machinery Hall" has not grown along with the rest of the institution. It is now as it has been for many years.

It is not an easy matter to get a showing that will be representative of Canadian industry in the mechanical world. Much of the most interesting machinery is heavy and difficult to transport, and it is not an easy matter to get it erected and in operation to the best advantage.

There are many lines of machinery also that have nothing but a spectacular or passing interest for those who flock to the exhibition. Makers of machine tools, for instance, do not sell to the crowd. It may be very interesting and gratifying for them to have a big crowd around watching their machinery in operation, but that is not nearly as satisfactory to the business office of the firm as getting two or three real prospects in the corner and talking brass tacks to them for half an hour. There may be tens of thousands of spectators and never a single purchaser or prospect for a future sale.

The firm that benefits most is one having something of popular interest and appeal for sale. A fair of this sort is a great place to show the fine points of a washing machine, electrical goods, etc. There are thousands of interested spectators for the demonstrations that may be given, and in that number there are thousands of prospective purchasers. The same can be said of firms that have machinery on exhibition that has a special appeal to the agriculturist. The farmer is a good buyer just now. He already leads the automobile procession. He has the money and he is, through force of circumstances, and a desire to advance, going in for the purchase of farm machinery that will make him less dependent on farm help.

For these reasons and others it is a difficult matter to get together an exhibition that would be thoroughly representative of Canadian machine tool trade. Those that are exhibiting have done well, although the exhibits are not by any means limited to Canadian products. The present premises are not such as will bring out the best exhibits. They are cramped, none too well lighted, and the space available is too limited.

The Way of the World

"All our straw hats marked away down. $3 hats to go for $1 in this clearing out sale."—Advertisement.

Of all the things that make me sick, and turn me boilin' mad. and make my countenance and purse alike feel flat and sad, it is to read such things as this—I feel most awful mean to think my joyous braided hat is only worth one bean.

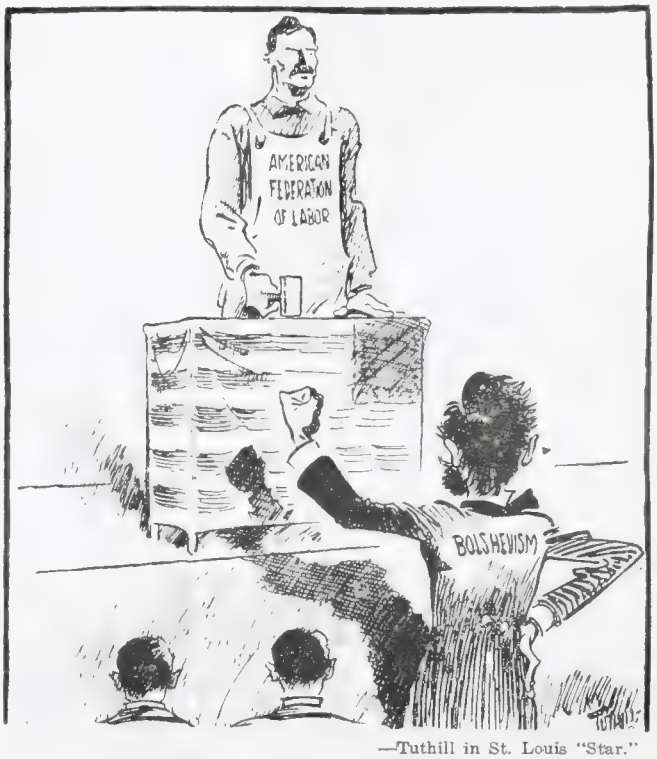
It's only just a month ago I tried to make a splash, and peeled three legal dollar bills from off my scanty cash.

And when I donned that three bone lid I felt just like a sport, or like a fashion plate that walks on Broadway in New York. But every gump that meets me now, and every ragged kid, will make a nasty face and snort: "Oh you one dollar lid!"

The old hat was a fearful thing, it was a sight to see—it looked as though it had been worn way back in '93. But even so it makes me sick, it gives my brow a pain to think of those two worthy beans I breezed away in vain.

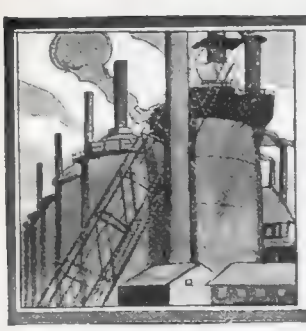
But every dog has had his day, and so has every hat, the trouble comes when these here things don't know just when to scat.

You may be worth a pile to-day, with money in the bank, you may have quit the common clay and be a man of rank. But your time comes, and out you go with dull and sickening plunk, to camp with other has beens upon the pile of junk.—ARK.



—Tuthill in St. Louis "Star."

"Sit down, you're out of order."



MARKET DEVELOPMENTS

What Will Happen In The U.S. Steel Market?

Strike Shadow Causes Some Uneasiness, And Buyers Cannot Secure Definite Promises at U.S. Mills—Extensive Selling of Agricultural Machinery is Reported to Have Taken Place

NOT so very many weeks ago buyers were hesitating about going into the steel market to make purchases for future needs in large quantities. They preferred to buy for actual requirements, and to pay warehouse rather than mill prices for what they secured. Now the chances are that a large buyer would find it very difficult to get a mill to give him anything like a definite delivery promise. The uncertainty that exists regarding the labor situation in United States, especially as it centres around the steel mills, is having the effect of stimulating purchases in many lines, on the assumption that it may be hard to get supplies later on should the strike fever break out, as it threatens to do.

Canadian mills are well booked in some departments, and although no price changes have been made, there is a very plain intimation that bar mills will have new figures for the trade before very long. These mills have a lot of business now, and are not keen to book in some cases at prevailing lists.

Buying is quite general in plates, tubes, etc. In fact so urgent has been the call for plate in some cases that warehouse prices have been paid for tonnages that under ordinary circumstances would have gone to the mills. Delivery from the mills is not improving, this being especially true of the boiler tube situation where there is considerable spread now between the time of order and that of delivery.

The automobile business is still a good purchaser of machine tools, and other interests that have contracts from these firms are also buying. Dealers handling agricultural machinery report heavy sales. In fact one large distributing firm reported this week that they had sold their allotment of tractors already, including those that had been counted on to keep their sales force busy right up to the end of the year.

Scrap metal shippers are not selling very heavily, unless under contract, there being a feeling that it is good policy to wait until the New York and Chicago markets settle down. There seems to be a feeling that manipulation is going on in some centres, and holders of good qualities are simply letting matters stand. Prices remain stationary.

MONTREAL FEELS EFFECTS OF THE LABOR AGITATION IN THE STATES

Special to CANADIAN MACHINERY.

MONTREAL, Que., August 26.—While industry in this district is comparatively free from labor troubles, the situation, nevertheless, is more or less dominated by the developments in the States, as the market here is virtually a reflection of American conditions; this is characteristic of the steel trade, and until the general unrest has been removed the market here will naturally be influenced in no small degree by American conditions. Nothing is definitely known as to the possible attitude of the producers should labor force their hand, but, in the opinion of some dealers here, it would not be surprising if some of the mills were closed indefinitely. The policy of the mills in declining extensive orders for future delivery is a feature that emphasizes the serious possibilities that may arise within the next month or so. Steel trading in this district is not what might be called active nor can it be said that business is dull, as there is a steady though light demand for many classes of material. Some good trading has been done in light structurals. There is hardly any exception to the general rule of conservative buying as consumers are reluctant to purchase far beyond their immediate requirements. This attitude will probably continue throughout the year, and until such time as the prevailing unrest affects the market and general reconstruction. Non-ferrous metals are firm locally but show strength in the States. Machine tool business is light but steady. Iron and steel scraps are weak while old metals are taking on strength.

Metals Firm on Steady Demand

Little change is reported in the local situation and the demand continues steady but of comparatively light volume. There is an upward movement of metals in the States, but the strength has not, as yet, influenced the market here although there is a prospect of advances before the beginning of the month. Brass interests are steady buyers but just in sufficient quantities to satisfy present needs. Tin is moving freely at 60 cents per pound. Lead is in better demand and local prices have advanced ¼ of a cent, the quotation being 7½ cents per pound. Local dealers are quoting antimony at 10 cents, a decline of ¼ cent. on the week.

Higher Cost on Delayed Delivery

Little disposition is shown on the part of users of machine tools to buy in other than single or small quantities, but the volume of business done in this way is considerable and of a fairly steady character. No class of equipment is favored and apparently the business is widely distributed. A factor that adds to the difficulties of the dealer is the fact that price quotations are far from stationary, and where delays arise after a quotation has been made there is a likelihood that an advance may be made before the actual order will be placed. Another factor is the exchange rate when tools are brought in from the States. On extended delivery there is a great possibility that the ultimate cost of a machine will exceed the estimate made at the time the order was placed.

As stated by a dealer here, the duty charged is based on the price of the machine at the time of shipment, so that when an advance is made by the manufacturer, the added duty must be shouldered by the dealer, or some arrangement made between the dealer and the customer. There appears to be a tendency on the part of the Canadian manufacturer to follow in the wake of the American manufacturer and mark up his quotations so that they are slightly lower than what a customer could obtain a similar machine—for from the other side, and the result in many cases is that the American manufacturer gets the business. In spite of the steadily-increasing costs, however, the present inquiry is good and no falling off in general business is reported; in some instances the month's turnover has shown a slight increase.

Non-Ferrous Scraps Firmer

The disturbances that are prevalent throughout the steel producing industries in the States have had the effect of considerably curtailing the trading in old materials, especially iron and steel scraps, and in consequence the market here has felt the reaction that has taken place across the line. The interest of large consumers has fallen off considerably and dealers are awaiting further developments in the steel industry. The result of these conditions is shown in the quiet tone of the current market. Sales are very light but dealers are holding to last week's quotations, although the weaker tendency may influence prices before the week closes. The old non-ferrous metal situation is brighter and the increased strength of the metal market is reflected in advances in some of the scraps. Old coppers have been advanced 1 cent per pound, and in general the prices on all other metals are firm.

POINTS IN WEEK'S MARKETING NOTES

Labor troubles threaten to break out in the effort to unionize the steel industry in the United States.

—

Warehouses in many cases are buying now, looking for firmer prices in the near future in several lines.

—

Large sales are being made, especially in plate, some shipments being large enough to rank as fair-sized mill orders.

—

The report, published in these columns several weeks ago, of a ten per cent. reduction in the price of high speed and carbon drills, was not correct. The information was given to CANADIAN MACHINERY in good faith and published in the same way.

—

Large dealers in scrap material are not shipping, except on contract, until affairs in the U.S.A. markets become more settled. Prices, though, are firm.

—

The low value of the German mark at present makes it profitable to do business with that country, and U.S. machine tool builders believe it is keeping them from securing many European orders.

—

At present it costs a French firm $1.60 to buy a dollars' worth in New York.

GOOD BUSINESS IS COMING IN NOW

Dealers in Many Lines are Outspoken Regarding What They Are Securing Now

TORONTO.—There can be no doubt about the good business that is being done in every line, from machine tools' salesmen right through the lists to the warehousing interests. Buying is not restricted to any particular line, and in this, one finds good news. Purchasing is becoming quite general. Dealers also add that there is less of a tendency now to look out for used equipment, as in many cases the specifications now are for new goods entirely.

As far as the buying of machinery is concerned, the automobile business is furnishing the bulk of the business, and this is likely to develop in more ways than one. For instance, the building of a large plant for the General Motors at Walkerville is opening up several accounts for material that have been closed for some time.

"CANADIAN MACHINERY" several weeks ago published an item stating that there had been a ten per cent. reduction in the price of high speed and carbon drills, on the part of the makers. We have since been informed that this information is not correct, although it was given to this paper in good faith in the first place, and accepted as such.

Big Orders Placed

"The best two weeks of the year" was the way one of the largest warehousing interests sized up the business of the past fortnight, when discussing the market situation with CANADIAN MACHINERY this morning. This firm has a pretty warehouse in some lines as the result of heavy buying that has been going on. The demand for some of the lines has been urgent, plate being one of them. To show the business that is being done it might be mentioned that one firm took a shipment of forty tons from a warehouse stock, not being able to wait for mill shipment. Of course, the warehouse price is a stiffer one than mill shipment, but in this case it was delivery that was wanted and paid for.

Warehouses are buying quite heavily in some cases although in others they have not cleared out the large war stock that was being carried. One of the dealers stated this morning: "We are buying heavily now, because we confidently expect that prices are going up to a higher level than they are at present. There are labor troubles of several kinds on the horizon in the steel mills district, and these, along with other tendencies, are going to keep prices up. We regard it as a good policy on our part to buy enough now to put us in good shape for some weeks and months to come.

The Trend of Prices

If one doubts the fact that prices are headed upward, it is not hard to produce evidence. For instance, there was one order out this week for a large amount of bars for bridge work, the whole lot amounting to some 186 tons. The order was offered to one of the mills that usually has a pretty fair bar capacity, and it was thought that it was a very acceptable piece of business, as there was a section of 125 tons of ¾ roun in long strips, which would make a nice long run. However, the mills turned the business down flat at the market price, stating that they did not care whether they booked any more bars for six weeks, and that the price on this line was going to go higher. That seems to be the feeling in several centres, but so far there have been no definite increases announced to the jobbers. Prices from the warehouses are, therefore, just where they have been quoted for some time back.

Plate and tubes generally go pretty much hand in hand, and they are both moving out rapidly at present. Some of the larger boiler shops are very busy indeed, and are filled with work that will run on for some months to come. There is a nice large job, likely let by now, by some of the large Northern Ontario firms, that will call for a large amount of steel construction work. Tubes are not easy to get, dealers being advised by the mills that there is a shortage of skelp. Whatever the reason, it is a fact that deliveries are poor, and shipments are made on two months instead of two weeks in many cases

The British Goods

Reference has been made in these columns before of the efforts that are being made to get British goods on the market again, and of the small success that is being met with. There is another case just now, and it will be rather interesting to watch developments and see what comes of it. One of the Ontario shipbuilding firms has a contract now, on which it is desired, for several reasons, to use British material as much as possible. The firm sent to several dealers in Toronto asking for quotations in British goods, especially chains and anchor. Reply was made that it was almost impossible to get a straight bid from British firms now, as their figures were filled with so many clauses regarding labor troubles and strikes, shipment, etc., that they could hardly be considered as a real bid. So the firm forwarded

a definite quotation from a U.S. concern and let it go at that. The shipbuilding people came back immediately asking for a quotation on the British goods, stating that they would be prepared to wait for six months for delivery. So there is a demand for the British made goods, if they can be supplied. The trouble is in many cases that they are not to be had.

The Machinery Market

There is a lot of business moving in the machine tool market. The same can be said of the motor market. Wood working machinery is also very brisk. The automobile business is doing a lot of buying now, and the firms that have contracts from that line are also in the market. Dealers handling agricultural machinery are doing in some cases a land office sort of business. One of the largest distributors stated to CANADIAN MACHINERY this morning that they had cleared out entirely their line of tractors already, including all that they had reckoned would be sold between now and the end of the year. They are having some more rushed along in order to make a showing at the Toronto fair this week. They had thought previously that they were booking plenty to hold their sales force for the entire year, but they are away out on their count.

There are some nice queries coming into the market now, especially for tool room stuff, and in nearly every case there are new machines being placed. Dealers find trouble increasing in securing anything like good deliveries, as the firms making machines that are much wanted are sold right up, and shipments come direct from factory.

The Scrap Metal Market

There is a feeling of doubt in the minds of some of the large dealers in scrap metals as to what the next move is going to be. There seems to be an impression that there is some manipulation going on in the larger consuming and buying centres, and until this is dispelled it is likely that there will be a tendency on the part of some of the larger dealers in Canada to sit tight. It may be that there will be a slight dip in values, but it is hard to see where it can last for any length of time. It is claimed by several that tho coppers and steel have reached their peak for some time at least, and that they are not due for much higher figures. However, there is no feeling that they will travel far in the opposite direction. Some of the smaller sellers feel that right now is a good time to sell their material, and they are still letting it go, particularly as the buyers here and in Montreal are standing behind the prices that have been ruling for some weeks past, and it hardly seems likely, unless something unforeseen happens, that there will be any reduction in buying values.

NEW YORK MARKET FINDS THAT EXCHANGE RATE IS HURTING TRADE

Special to CANADIAN MACHINERY.

NEW YORK, August 28.—There are indications that a considerable business in machine tools could be done with some of the European countries if it were not for the unfavorable rate of exchange. Moreover, this situation is playing right into Germany's hands, as the low value of the mark makes it extremely profitable for European countries to do business with Germany. Even France and Belgium may be forced, in self-protection, to buy German rather than American machine tools. To buy one dollar's worth in the United States requires the equivalent of $1.60 in French francs, and France certainly cannot pay such a premium for the privilege of buying here, except such things as she cannot procure elsewhere.

An inquiry for more than 400 machine tools for a complete automobile plant to be built in Sweden is being figured on by American tool builders, but here also the exchange rate operates against the orders coming to the United States. It is understood that the company prefers American tools, but may be forced to buy British or German make.

The Finnish state railways want about $50,000 worth of tools from the United States, but there is no international exchange between the two countries, so the business probably will go to England, which is buying Finland's dairy products.

The matter of credits is also an obstacle in the placing of foreign machine-tool orders here. Poland, for example, recently bought 150 locomotives from the Baldwin locomotive works and now wants 200 machine tools for a locomotive repair shop. In the case of the locomotives, the Baldwin Company arranged its own financing, and it seems probable that it will also equip a repair shop for Poland's railways, inasmuch as private banking interests are loath to grant the desired credits.

Japan in Favor

Japan is about the only important foreign buyer of American tools that can buy here on favorable terms. Considerable business has been closed with that country, and inquiries now in the market for equipping shipyards and other plants aggregate several hundred thousand dollars.

Expansion of the automobile industry continues, and two eastern "war plants" have passed into the hands of leading automobile concerns. The plant of the International Arms and Fuse Co., Bloomfield, N.J., has been sold to the General Motors Corporation, and the plant of the Duesenberg Motors Corporation, Elizabeth, N.J., has been acquired by the new Willys Corporation, which will use it for the manufacture of six cylinder motors for the new Willys car. The International plant was used during the war for the making of shells, fuses, etc. Practically all of its machine-tool equipment has recently been sold.

Domestic buying is fairly quiet, but this is not surprising as August usually is a dull month.

The Baldwin Locomotive Works, Philadelphia, has placed an order with the Niles-Bement-Pond Co. for 16 overhead cranes, eight of 20-ton and eight of 10-ton capacity. A small list of tools also was bought, all of this equipment being for a new cylinder shop at Eddystone, Pa.

MORE STACKS BLOWN IN

There is still a very good demand for pig iron although the sales are smaller than last week's. Prices remain firm with a tendency to increase, and more stacks are being blown in. Reports from United States points follow:

Philadelphia.—Quite a bit of 1920 first quarter business has been booked, although prices for this delivery are quoted $2 to $3 above present prices. Some foundry iron of the 2X grade has been sold at $28.50, but many makers look on $29 as the minimum for this grade. Basic is not active, but there is good enquiry for foundry iron for last and first-quarter delivery.

Boston.—Furnaces here are receiving small orders for last-quarter delivery, but no one seems to be anxious for first-quarter orders. The aggregate of the sales for last week was only 4,500 tons, which is one of the lowest, if not the lowest for the last two months.

New York.—Some foundry iron for the first half has been sold here at a price about $2 better than iron for this year's delivery can bring. The total of sales amounted to about 10,000 tons, and the market is strong. There is some good enquiry for export business, including 4,000 to 5,000 tons basic for England and Italy.

Pittsburgh.—The market in this district is pretty well sold up, and with the decreasing demand there is less talk of higher prices. Two stacks have been blown in, and two more are expected to be lighted during the next two weeks. There is an enquiry for from 5,000 to 10,000 tons basic not yet covered, but otherwise steel foundries are pretty well stocked up.

Buffalo.—With two makers out of the market, business has been pretty good during the week. One maker booked an order for 10,000 tons foundry iron, which about filed their capacity for the balance of the year. High silicon and high phosphorus grades are in good demand, as are manganese and manganesite. Enquiries for about 7,500 tons are reported.

Cleveland.—Makers are hanging back from 1920 orders, as they feel that it is too soon to form an opinion of the probable costs. There is a large volume of enquiries, and business which fell off

a little at the end of last week revived at the beginning of this week. Prices are firm.

Cincinnati.—Owing to the closing down of silvery stacks due to labor troubles, high silicon iron is hard to procure. Foundry iron is getting scarce and is quoted at $27.50, Birmingham, for 1.75 to 2.25 silicon. Consumers are buying third-quarter delivery iron to use in first quarter, as first quarter delivery iron cannot be obtained.

Chicago.—With most producers sold up to capacity there is every possibility of higher prices. Further production will be made as two stacks will be blown in very shortly. Southern iron is being beaten in the market here by iron from the Algoma Steel Co.'s plant at the Soo. Malleable is the most active, with silveries scarce.

NOW SEES A SERIOUS SITUATION AHEAD OF THE STEEL MARKET IN U.S.

Special to CANADIAN MACHINERY.

PITTSBURGH, PA., AUG. 28.—The iron and steel market has been dominated more or less in the past week by the labor situation and prospects, if the present uncertainty may properly be referred to as constituting "prospects." The steel mills have been almost entirely out of the market as sellers, except for the booking of such orders as regular customers insisted that they take, while they have been entirely out of the market as buyers, showing no interest whatever in such commodities as scrap, ferromanganese, ferrosilicon, etc.

While the market has been chiefly under the influence of the labor situation, it can hardly be said that the trade at large fully appreciates the seriousness of the situation. The large mills probably do, but even that is not certain. Some of the small mills apparently do not. Buyers have been showing apprehension that at some time in the not distant future there may be a restriction of output through labor difficulties, but few buyers seem to have realized that matters were likely to come to a head by September 1st. That, however, represents an opinion based upon the best collection of information obtainable.

Mills are fairly well sold up and buyers are of course, correspondingly well covered, i.e., the buyers who are jobbers or manufacturing consumers, while buyers who have construction work in view are in some cases covered and in some cases not. There is considerable tonnage involved in construction projects approved, but against which purchases have not been made, and most of this business is held up. For instance, there is a large building which it is desired to erect at once, and which will require 8,000 tons of concrete reinforcing bars. The buyer has been importuning one large mill after another to take the order, without success. A small mill could not handle the tonnage.

In present circumstances there is no issue in the market as to prices. Prices are now more thoroughly "stabilized" than even the Industrial Board of last March and April ever hoped to stabilize them, for no one would, of course, think of cutting prices at this juncture, while talk of advancing prices is altogether taboo. Labor is very restive and to advance any price would simply be to furnish ammunition to labor agitators. That is a fact that the United States Steel Corporation recognized three months ago, and made no secret of, but some of the independents have only lately grasped the point.

Labor Situation

There are really two labor situations. On the one hand the American Federation of Labor has been endeavoring to organize the entire iron and steel industry with the object of securing certain demands or calling a general strike. On the other hand several strikes have actually occurred, at widely separated points. In the past ten days, for instance, there have been three strikes in the sheet industry alone, at Wheeling, W. Va. Canton, O., and Newport, Ky. These and other strikes can hardly be regarded as directly a part of the American Federation of Labor program, for that contemplates a general strike and can hardly be aided by the men going off at half cock at this point and that. A definite indication that the detached strikes have no connection with the general program is that the strike at the steel and wire plant at Peoria, Ill., was settled a few days ago, and on the basis of the men being given a wage advance of 5 per cent. when their demand had been 12 per cent. advance. The Federation demands are much broader, and look more to working conditions than to mere wage rates. There is quite a collection of things they want, embodied in the list of 12 points formulated and made public July 20, including such items as the check-off, abolition of physical examinations, abolition of company unions, the eight-hour day, seniority to apply in employment and dismissals, etc.

The effort to organize the iron and steel trade was inaugurated at the St. Paul annual convention of the American Federation of Labor last year. At the Atlantic City convention last June a report was made, showing the progress had not been up to expectations, and giving the principal cause of the slowness of the work the fact that many municipalities, particularly mill towns in the Pittsburgh district, would not grant permits for holding labor meetings. Organizing efforts were increased, however. Sunday, July 20, a meeting was held in Pittsburgh of representatives of 24 labor organizations, the meeting enunciating a set of 12 demands and ordering that a strike vote be taken, to be completed in 30 days, the vote to be on the proposition, whether the men would back up the "National Committee for Organizing Iron and Steel Workers" should it consider it desirable to call a strike. Another union, that of hod carriers, was afterwards added, making 25. A point in this, as in all American Federation of Labor activities, is that each man must belong to the union particularly adapted. Among the 25 unions are those of blacksmiths, brick and clay workers, bricklayers, machinists, stationary firemen, etc., etc. The rank and file of the workers at blast furnaces and steel mills would belong either to the International Union of Mine, Mill and Smelter Workers or to the Amalgamated Association of Iron, Steel and Tin Workers.

The strike vote was announced at Youngstown on the evening of August 20, but was merely to the effect that 98 per cent. of the votes were affirmative. There is no line on the total number of voters. A statement merely of the number of voters, however, would not be particularly illuminating, and certainly would not be conclusive, for if the voters comprised only 10 per cent., or 20 per cent., of the total number of employees the question would be whether they are men engaged in such work that their withdrawal would cripple operations. For illustration, one of the 25 unions is the "Switchmen's Union of North America." If these men quit others might or might not take their places, but if no switches were turned it would be minutes in some plants and only hours in other plants before operations would have to cease.

On the date the vote was announced the committee decided to allow a period of ten days for the arranging of a conference with the employers, and the intimation has been that if within that period, which ends Saturday, August 30, the manufacturers do not agree to a conference a strike will at once be called. It is altogether improbable that the manufacturers will refuse to enter a conference and do nothing else. It is likely they will close their plants suddenly if they foresee a strike coming, although they may agree to confer. There being no organization of iron and steel manufacturers which the organizing committee can approach, its course was to address a letter to Judge Gary, as the head of the dominant interest, and they followed this by going to New York in a body at the end of last week. Mr. Conners was expected to arrive in the United States from his trip abroad August 27, or before the time limit expired and in time for a conference.

A. T. Weldon, formerly assistant traffic manager of the C. P. R. at Moncton, N. B., has been appointed to a similar position with the Company, with headquarters at Montreal, succeeding Guy Tombs, who has resigned. M. F. Tompkins will succeed to the position vacated by Mr. Weldon.

Peace Time Exhibits In Machinery Hall C. N. E.

Manufacturers and Agents Have Representative Display of Machine Tools and Industrial Equipment at Canadian National Exhibition.

PEACE time activities are reflected in the various exhibits in Machinery Hall this year. The entire absence of shell machinery and munition-making apparatus is quite noticeable, albeit expected to those accustomed to the exhibits of former years. Space is again at a premium, and as usual comment unfavorable and forcible is apparent at the inadequate provision made for the machinery industry.

Exhibits

The Delcro Smelting and Refining Co. have an exhibit of their well-known Stellite alloy for cutting tools, comprising milling cutters, arc welded tools, etc. In addition to this they have an exhibit of the other products made at their refinery including cobalt and nickel metals and oxides, metallic powdered aluminum, refined arsenic, etc. Representatives, Thos. Southworth and B. Horwood.

Geo. W. Cole, Ltd. are exhibiting the Cole steam trap in its various designs. Cross-section models of the working parts of these traps are shown, and a typical double trap boiler feeding installation, together with other features, render this exhibit interesting to the power plant engineer. Representative, Wm. H. Rose.

Barnes and Peckover are displaying concrete reinforcement materials in various forms, and Teralun anti-slip treads, plate and coal hole covers, Steelcrete expanded metal machine guards, etc. are also featured, together with an excellent display of Triumph superb high-speed steel, cold drawn and nickel steel bars.

The Dodge Co. are featuring steel pulleys, wood split pulleys, transmission chains, split clutches, hangers and bearings, conveyor material, gears, couplings, etc. Representatives, W. Burrows, S. M. Bowen, J. R. Gray.

The Cleveland Pneumatic Tool Co. of Canada, Ltd., are showing a complete line of pneumatic tools and appliances such as are used extensively in the shipyards of Canada and the United States. A line of compressed air drills, accessories and hose is also shown. Representatives, C. D. Garner, manager Canadian division, and D. C. Lacy.

The Garlock and Walker Machinery Co. have a very representative display of the various lines handled by their firm. These comprise a Gooley-Edlund Co. miller; a Steptoe 20-in. shaper; a Bath No. 2 universal grinder; a Fitchburg 8 by 36 in. cylindrical grinder, and Ryerson-Conradson single pulley milling machines. Their pneumatic and electric tools are also shown. The Cataract line of lathes is also shown in a very complete manner. Representatives, Mr. Garlock, Mr. Walker and Mr. Brown.

Jones and Moore have a representative display of their various motors and generators and of the American shoe machine for which they are the agents. This firm handles a large stock of Century motors for all conditions of service.

The Canada Machinery Corporation have a fine exhibit of iron and wood-working tools. This exhibit includes a straight-edging and jointing machine for furniture and piano factories, a hollow chisel mortiser, a heavy pony planer, and a universal rip and cross-cut saw. The iron working tools comprise a 20-in. back-geared power feed drill press, a 14-in. double back-geared quick-change engine lathe, a 20 by 22 in. back-geared crank shaper. The 14-in. quick-change tool room lathe is one of the newer products of this firm, and is notable for the ease with which all changes in feeds and speeds can be carried out. Representatives, D. King. M. M. Preston, J. C. Carley, P. B. Burton, H. O'Donnell.

The Canadian Ice Machine Co. have an excellent exhibit of refrigerating supplies and materials; fittings, ammonia, calcium, chloride, and other supplies being featured. This firm are the manufacturers of the York refrigerating systems and compressors, installations being made from ¼ ton up in the direct expansion, absorption or CO_2 systems, the latter being popular and of considerable adaptability for hospital and marine work.

The Cling Surface Co. are exhibiting for the eleventh consecutive year. The preservation and waterproofing of belts and the lowering of the friction load consequent upon the permissible slackness of the belts are shown to advantage by means of a one h.p. motor driving a three-plunger oil pump through a number of belts treated with cling-surface. Representative, G. W. Faatz.

The A. R. Williams Co. have an excellent display of iron and wood-working tools. A variety of drill presses is shown, including a 22-in. Barnes back-geared power-feed drill with automatic stop and sliding head. A heavy duty universal milling machine of Le Blond make is on display together with a universal cutter and reamer grinder by the same firm. A Gould and Eberhardt 24-in. crank shaper is shown, and a No. 4 Warner and Swazey universal turret screw machine is also displayed. A Le Blond 18 by 8 engine lathe, fitted with quick-change gears also forms part of the iron working tools. Marine internal combustion engines are shown together with others adapted to stationary use. Woodworking machinery is well represented by means of a 24-in. planer built by the MacKenzie Machinery Co., Preston; a 36-in. bandsaw, built by the Preston Woodworking Machinery Co.; a MacKenzie planer and matcher, and a MacKenzie saw table. The supply department is also well represented, featuring with Starrett tools and Brown & Sharpe cutters, reamers, etc., together with plumbers' and steam fitters' brass goods. As in former years, this excellent exhibit is under the charge of Mr. Cronk, and the arrangement is due to him.

The Chapman Double Ball Bearing Co. have, as usual, a most attractive exhibit of the various lines manufactured by them in the centre row at Machinery Hall.

In addition to the ball-bearing shaft hangers used in the line shafting, the exhibit includes bearings for all sizes of shafting up to six inches; also annular and thrust bearings for machinery, automobiles and trucks. Representative, Mr. Hocken.

D. K. McLaren Ltd., represented by Mr. W. S. Hamilton, sales manager, are exhibiting their line of single and double leather beltings, together with their waterproof varieties. In connection with these latter an interesting demonstration is given. Two belts are arranged to pass through pans of water while turning over pulleys. Other lines shown are the D. K. wood split pulleys, the Philips pressed steel split pulley and mill supplies for the carding, weaving and spinning trades.

The Goodyear Tire and Rubber Co. are showing a complete line of mechanical rubber goods such as thei fire hose, extra service pneumatic hose, and Goodyear cord hose, extra power belting, packings, perforated mats, etc. Representatives, W. H. O. Crosby, F. Woods, F. Fox, and E. Dodge.

The Dominion Belting Co., Ltd., are exhibiting Maple Leaf brand stitched cotton duck waterproof belting for transmission of power and conveying This is shown in various sizes, and excellent literature is distributed, showing its capabilities and endurance. Maple Leaf belt dressing is also on exhibit. Representative, John Scott.

Cowan and Co., Galt, are showing some of their woodworking machinery. Among the machines on exhibit are a chain saw mortiser, a hollow chisel mortiser, a power feed rip saw, and a universal woodworker. This latter machine combines the functions of rip and cross-cut saws, buzz planer, borer and hollow chisel mortiser into one machine. A power jig saw is also shown, and a new machine recently patented is shown in their patent hoop bender. This ma-

Continued on Page 243

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON

Grey forge, Pittsburgh	$27 15
Lake Superior, charcoal, Chicago	34 60
Standard low phos., Philadelphia	....
Bessemer, Pittsburgh	29 35
Basic, Valley furnace	25 75
Toronto price:—	
Silicon..2.25% to 2.75%	$32.75 to $35.75

IRON AND STEEL

Per lb. to Large Buyers	Cents
Iron bars, base, Toronto	$ 4 25
Steel bars, base, Toronto	4 25
Steel bars, 2 in. to 4 in. base	5 50
Steel bars, 4 in. and larger base	6 00
Iron bars, base, Montreal	3 75
Steel bars, base, Montreal	3 75
Reinforcing bars, base	4 50
Steel hoops	5 50
Norway iron	11 00
Tire steel	5 50
Spring steel	8 00
Brand steel, No. 10 gauge, base	4 40
Chequered floor plate, 3-16 in.	6 50
Chequered floor plate, ¼ in.	6 25
Staybolt iron	8 00
Bessemer rails, heavy, at mill	....
Steel bars, Pittsburgh	2 35
Tank plates, Pittsburgh	2 65
Structural shapes, Pittsburgh	2 45
Steel hoops, Pittsburgh	3 05
F.O.B., Toronto Warehouse	
Small shapes	4 50
F.O.B. Chicago Warehouse	
Steel bars	3 62
Structural shapes	3 72
Plates	3 90
Small shapes under 3"	3 62

FREIGHT RATES

	Per 100 Pounds. C.L.	L.C.L.
Pittsburgh to Following Points		
Montreal	33	45
St. John, N.B.	41½	55
Halifax	49	64½
Toronto	27	39
Guelph	27	39
London	27	39
Windsor	27	39
Winnipeg	89½	135

METALS

	Gross.	
Lake copper	$27 00	$27 00
Electro copper	26 00	27 00
Castings, copper	26 00	25 00
Tin	60 00	58 00
Spelter	10 00	10 00
Lead	7 50	7 00
Antimony	10 00	10 50
Aluminum	36 00	35 00

Prices per 100 lbs.

PLATES

	Montreal	Toronto
Plates, ½ up	$ 4 50	$ 4 50
Plates, 3-16 in.	4 90	4 90

Price List No. 38

WROUGHT PIPES

Standard Buttweld

⅛ in.	$ 6 00	$ 8 00
¼ in.	4 68	6 81
⅜ in.	4 68	6 81
½ in.	6 21	7 78
¾ in.	7 82	9 95
1 in.	11 56	14 71
1¼ in.	15 64	19 90
1½ in.	18 70	23 76
2 in.	25 16	32 01
2½ in.	40 37	51 19
3 in.	52 79	66 94
3½ in.	67 16	84 18
4 in.	79 57	99 74

Standard Lapweld

2 in.	38 81	35 34
2½ in.	42 12	52 36
3 in.	55 08	68 47
3½ in.	69 00	86 94
4 in.	81 75	103 00
4½ in.	93	1 18
5 in.	1 08	1 37
6 in.	1 40	1 78
7 in.	1 83	2 32
8L in.	1 93	2 44
8 in.	2 22	2 81
9 in.	2 66	3 36
10L in.	2 46	3 12
10 in.	3 17	4 02

Terms 2% 30 days, approved credit.

Freight equalized on Chatham, Guelph, Hamilton, London, Montreal, Toronto, Welland.

Prices—Ontario, Quebec and Maritime Provinces

WROUGHT NIPPLES

4" and under, 60%.
4½" and larger 50%.
4" and under, running thread, 30%.
Standard couplings, 4" and under, 40%, 4½" and larger, 20%.

OLD MATERIAL

Dealers' Buying Prices.

	Per 100 Pounds. Montreal	Toronto
Copper, light	$16 00	$13 75
Copper, crucible	19 00	18 00
Copper, heavy	19 00	13 00
Copper wire	19 00	18 00
No. 1 machine composition	17 00	16 75
New brass cuttings	13 00	10 75
Red brass cuttings	15 00	14 75
Yellow brass turnings	10 00	9 00
Light brass	8 00	7 00
Medium brass	9 00	7 75
Scrap zinc	6 00	6 00
Heavy lead	5 00	5 25
Tea lead	3 75	3 50
Aluminum	18 00	18 00
	Per Ton.	Net
Heavy melting steel	13 50	13 50
Shell turnings	7 00	6 00
Boiler plate	13 50	11 00
Axles (wrought iron)	20 00	20 00
Rails	14 50	13 50
Malleable scrap	15 00	17 00
No. 1 machine cast iron	20 00	18 00
Pipe, wrought	8 00	5 00
Car wheels	20 00	20 00
Steel axles	20 00	20 00
Mach. shop turnings	6 00	6 00
Stove plate	14 00	13 00
Cast boring	7 00	8 00

BOLTS, NUTS AND SCREWS

	Per Cent.
Carriage bolts, ⅜" and less	35
Carriage bolts, 7-16 and up	15
Coach and lag screws	50
Stove bolts	65
Wrought washers	50
Elevator bolts	25
Machine bolts, 7-16 and over	40
Machine bolts, ⅜" and less	40
Blank bolts	25
Bolt ends	25
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	10
Machine screws, fl. and rd. hd., brass	net
Machine screws, o. and fil. hd., brass	net
Nuts, square blank	add $0 75
Nuts, square, tapped	add 1 00
Nuts, hex., blank	add 1 00
Nuts, hex., tapped	add 1 25
Copper rivets and burrs, list less	15
Burrs only, list plus	25
Iron rivets and burrs	40 and 5
Boiler rivets, base ¾" and larger	$8 50
Structural rivets, as above	8 40
Wood screws, O. & R., bright	75
Wood screws, flat, bright	77½
Wood screws, flat, brass	55
Wood screws, O. & R., brass	55½
Wood screws, flat, bronze	50
Wood screws, O. & R., bronze	47½

MILLED PRODUCTS

(Prices on unbroken packages)

	Per Cent.
Set screws	50
Sq. and Hex. Head Cap Screws	45
Rd. and Fil. Head Cap Screws	20
Flat But. Hd. Cap Screws	10
Fin. and Semi-fin. nuts up to 1 in.	45
Fin. and Semi-fin. nuts, over 1 in., up to 1½ in.	40
Fin. and Semi-fin. nuts over 1½ in., up to 2 in.	25
Studs	30
Taper pins	50
Coupling bolts	10
Planer head bolts, without fillet, list	10
Planer head bolts, with fillet, list plus 10 and	net
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws	net
Collar screws	list plus 20, 30
Thumb screws	40
Thumb nuts	75
Patch bolts	add 20
Cold pressed nuts to 1½ in.	add $1 00
Cold pressed nuts over 1½ in.	add 2 00

BILLETS

	Per gross ton
Bessemer billets	$38 50
Open-hearth billets	38 50
O.H. sheet bars	42 00
Forging billets	51 00
Wire rods	52 00

Government prices.
F.O.B. Pittsburgh.

NAILS AND SPIKES

Wire nails	$4 70
Cut nails	4 75
Miscellaneous wire nails	60%
Spikes, ⅜ in. and larger	$7 50
Spikes, ¼ and 5-16 in.	8 00

ROPE AND PACKINGS

Drilling cables, Manila	0 39
Plumbers' oakum, per lb.	0 10
Packing, square braided	0 38
Packing, No. 1 Italian	0 44
Packing, No. 2 Italian	0 36
Pure Manila rope	0 37
British Manila rope	0 31
New Zealand hemp	0 31
Transmission rope, Manila	0 43
Cotton rope, ¼-lb. and up	0 74

POLISHED DRILL ROD

Discount off list, Montreal and Toronto ..... net

MISCELLANEOUS

Solder, strictly	$ 0 34
Solder, guaranteed	0 39
Babbitt metals	18 to 70
Soldering coppers, lb.	0 58
Lead wool, per lb.	0 14
Putty, 100-lb. drums	6 75
White lead, pure, cwt.	17 80
Red dry lead, 100-lb. kegs, per cwt.	15 50
Glue, English	0 35
Tarred slater's paper, roll	1 30
Gasoline, per gal., bulk	0 33
Benzine, per gal., bulk	0 32
Pure turpentine, single bbls., gal.	1 50
Linseed oil, raw, single bbls.	2 90
Linseed oil, boiled, single bbls.	2 92
Plaster Paris, per bbl.	4 50
Sandpaper, B. & A.	List plus 43
Emery cloth	List plus 37½
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 07
Rosin "G," per lb.	0 08
Borax crystal and granular	0 14
Wood alcohol, per gallon	2 00
Whiting, plain, per 100 lbs.	2 50

CARBON DRILLS AND REAMERS

S.S. drills, wire sizes up to 52	40
S.S. drills, wire sizes, No. 53 to 80	50
Standard drills, all sizes	50
3-fluted drills, plus	10
Jobbers' and letter sizes	50
Bit stock	40
Ratchet drills	15
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	50
Sleeves	50
Taper pin reamers	net
Drills and countersinks	list plus 10
Bridge reamers	50
Centre reamers	10
Chucking reamers	net
Hand reamers	10
High speed drills, list plus	10 to 40
Canadian high speed cutters	net
American	plus 40

COLD ROLLED SHAFTING

At mill	list plus 5%
At warehouse	list plus 25%

Discounts off new list. Warehouse price at Montreal and Toronto

IRON PIPE FITTINGS

Malleable fittings, class A, 20% on list; class B and C, net list. Cast iron fittings, 15% off list. Malleable bushings, 25 and 7½%; cast bushings, 25%; unions, 45%; plugs, 20% off list. Net prices malleable fittings; class B black, 24½c lb.; class C black, 15¾c lb.; galvanized, class B, 34c lb.; class C, 24½c lb. F.O.B. Toronto.

SHEETS

	Montreal	Toronto
Sheets, black, No. 28	$ 6 55	$ 6 00
Sheets, black, No. 10	5 15	5 45
Canada plates, dull, 52 sheets	8 50	7 10
Can. plates, all bright	8 50	8 00
Apollo brand, 10¾ oz. galvanized	....	....
Queen's Head, 28 B.W.G.	....	....
Fleur-de-Lis, 28 B.W.G.	....	....
Gorbal's Best, No. 28	....	....
Colborne Crown, No. 28.	....	....
Premier, No. 28 U.S.	....	7 50
Premier, 10¾ oz.	....	7 80
Zinc sheets	20 00	20 00

PROOF COIL CHAIN

(Warehouse Price)

B

¼ in., $13.50; 5-16, $11.50; ⅜ in., $10.50; 7-16 in., $9.30; ½ in., $10.15; $13.00; ⅞ in., $9.60; ¾ in., $9.70; ⅝ in., $9.95; 1 in., $9.50; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $16.75; 3-16 in., $15.40; ¼ in., $14.20; 5-16 in., $11.50; ⅜ in., $10.50; 7-16 in., $9.30; ½ in., $10.50; ⅝ in., $10.00; ¾ in., $9.70.

Prices per 100 lbs.

FILES AND RASPS

	Per Cent.
Globe	50
Vulcan	50
P.H. and Imperial	50
Nicholson	32½
Black Diamond	27½
J. Barton Smith, Eagle	50
McClelland, Globe	50
Delta Files	20
Disston	40
Whitman & Barnes	50
Great Western-American	50
Kearney & Foot, Arcade	50

BOILER TUBES.

Size.	Seamless	Lapwelded
1 in.	$25 00	$.....
1¼ in.	27 00	.....
1½ in.	28 00	26 00
1¾ in.	30 00	26 00
2 in.	30 00	26 00
2¼ in.	33 00	28 00
2½ in.	40 00	32 00
3 in.	46 00	38 00
3¼ in.	.....	45 00
3½ in.	56 00	42 00
4 in.	70 00	54 00

Prices per 100 ft., Montreal and Toronto

OILS AND COMPOUNDS.

Castor oil, per lb.	
Royalite, per gal., bulk	19½
Palacine	22½
Machine oil, per gal.	27½
Black oil, per gal.	16
Cylinder oil, Capital	52
Cylinder oil, Acme	39½
Standard cutting compound, per lb.	0 06
Lard oil, per gal.	$2 60
Union thread cutting oil, antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil, bbls. net	10¼

BELTING—No 1 OAK TANNED

Extra heavy, single and double	30%
Standard	30, 10%
Cut leather lacing, No. 1	2 20
Leather in sides	1 75

TAPES

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

PLATING SUPPLIES

Polishing wheels, felt	3 25
Polishing wheels, bull-neck	2 00
Emery in kegs, American	07
Pumice, ground	3½ to 05
Emery glue	28 to 30
Tripoli composition	06 to 09
Crocus composition	08 to 10
Emery composition	08 to 09
Rouge, silver	35 to 50
Rouge, powder	30 to 45

Prices per lb.

ARTIFICIAL CORUNDUM

Grits, 6 to 70 inclusive	**.08½**
Grits, 80 and finer	**.06**

BRASS—Warehouse Price

Brass rods, base ½ in. to 1 in. rod	0 34
Brass sheets, 24 gauge and heavier, base	$0 42
Brass tubing, seamless	0 46
Copper tubing, seamless	0 48

WASTE

XXX Extra	19½	Atlas	17
Peerless	19	X Empire	15½
Grand	18	Ideal	16
Superior	18	X Press	14
X L C R	17		

Colored

Lion	15	Popular	12
Standard	13½	Keen	10½
No. 1	13½		

Wool Packing

Arrow	25	Anvil	15
Axle	20	Anchor	11

Washed Wipers

Select White	11	Dark colored	09
Mixed colored	10		

This list subject to trade discount for quantity.

RUBBER BELTING

Standard ... 10% Best grades... 15%

ANODES

Nickel	.58 to .65
Copper	.38 to .45
Tin	.70 to .70
Zinc	.18 to .18

Prices per lb.

COPPER PRODUCTS

	Montreal	Toronto
Bars, ½ to 2 in.	$42 50	$43 00
Copper wire, list plus 10		
Plain sheets, 14 oz., 14x60 in.	46 00	44 00
Copper sheet, tinned, 14x60, 14 oz.	48 00	48 00
Copper sheet, planished, 16 oz. base	46 00	45 00
Braziers', in sheets, 6 x 4 base	45 00	44 00

LEAD SHEETS

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$10 25	$11 50
Sheets, 3½ lbs. sq. ft.	10 00	11 00
Sheets, 4 to 6 lbs. sq. ft.	9 75	10 50

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS

Acid, boracic	$ .25
Acid, hydrochloric	.06
Acid, nitric	.14
Acid, sulphuric	.06
Ammonia, aqua	.15
Ammonium, carbonate	..
Ammonium, chloride	.55
Ammonium hydrosulphuret	.30
Ammonium sulphate	.15
Arsenic, white	.27
Copper, carbonate, annhy	.50
Copper, sulphate	.22
Cobalt, sulphate	.20
Iron perchloride	.40
Lead acetate	.25
Nickel ammonium sulphate	.25
Nickel carbonate	.32
Nickel sulphate	.35
Potassium carbonate	.75
Potassium sulphide (substitute)	2.25
Silver chloride (per oz.)	1.45
Silver nitrate (per oz.)	1.20
Sodium bisulphite	.15
Sodium carbonate crystals	.05
Sodium cyanide, 127-130%	.40
Sodium hydrate	.22
Sodium hyposulphite per 100 lbs.	6.00
Sodium phosphate	.18
Tin chloride	.80
Zinc chloride, C.P.	.80
Zinc sulphate	.15

Prices per lb. unless otherwise stated

chine will bend barrel hoops without steaming and by an entirely new process. Representative, Mr. Cowan.

The Hoyt Metal Co. are featuring their lead-lined and resisting products such as valves, centrifugal pumps. Together with this line they are displaying their various other lines of metal goods such as solder, babbitt type metal, etc. Representatives, G. F. Allen, manager; S. Wheatley and W. G. Downes.

The Perfect Machine Co., Galt, are exhibiting a 12 by 6 in. lathe, a line of grinders with attached guards and a new line of buffing machines. Drilling machines and power hack saws are also shown. Representative, S. L. Clark.

The Lyman Tube and Supply Co. are featuring Shelby seamless steel tubing, together with the Chisholm and Moor anti-friction hoists. These latter are capable of 80 per cent. efficiency and are made in sizes up to 40 tons. Hyatt, Timkin and New Departure ball bearings are shown, together with electric railway supplies, made by the Electric Service Supplies Co. Chain belt and Rex products are also shown. Representatives, H. A. Jones, J. E. Openshaw, R. B. Bennett and Wm. Gardiner.

The Canadian Kron Scale Co. are showing a line of industrial scales. Representative, Mr. Smith.

The Wayne Forge and Machine Co. are showing their line of industrial brick and furnaces.

The Davis-Bournonville Co., of Toronto, have a fine exhibit of portable cutting and welding plants, acetylene generators and flare lights. An emergency cutting outfit for the use of fire departments is a feature that will attract notice. The No. 2 Oxygraph is an instrument to facilitate the cutting of any intricate shape in metal from one-quarter of an inch to 21 inches thick. The Radiagraph is another instrument on somewhat similar lines but used for cutting circles and straight lines. This can be bevelled to any angle, and the machines are portable. The firm is represented by J. F. Crowley.

Prest-o-lite have welding and cutting apparatus, supplies for same, contractors' flare lamps, dissolved acetylene and laboratory equipment on exhibition. They have also brazing and soldering apparatus, acetylene headlights for auto trucks, launches and locomotives. The representatives at the booth are F. T. Northwood, A. V. Tuthill, and A. W. Gimble.

The Climax Baler Co., of Hamilton, are showing a number of hand power balers for waste paper and other material which needs to be made up in small bales.

The John Hall & Sons, Ltd., Brantford, represented by Mr. Thompson, are showing several examples of their pipe threading machines. The large machine which can handle pipe from 2½ inches to 8 inches diameter is a fine looking piece of work, while the smaller sizes are also worthy of examination.

The Globe Engineering Co., of Hamilton, have quite a good variety of articles on view. Their lines include an electric welder, tool and cutter grinder, machine vices, lifting jack, and the Crowe roller bearing for automobiles. One of the most interesting exhibits is the loose chuck and special cutters for drilling square, triangular, hexagon or other angle holes. Several specimens of this class of work are on view. Mr. F. W. Robson is representing the firm at the Exhibition.

The Boiler Repair and Grate Bar Co., of Detroit and Toronto, have an exhibit of their shaking and dumping grate bars. These bars have been fitted in several

Continued from Page 240

local schools and public buildings. Mr. A. H. Hett and Mr. O. C. Hett are in charge of the exhibit.

The Canadian Hauck Burner Co., Ltd., are showing a number of their coal oil burners, which are in general use in foundry and shipyard work. Mr. Housel is in charge of the booth.

The Elliot Woodworker are exhibiting woodworking machinery, both electrically and gasoline-driven machines. A notable feature of these machines is the type of belt used, which consists of links of raw hide, with a steel core. This belt is claimed to be absolutely nonslipping. Mr. Elliot and Mr. Bradley are demonstrating these machines.

The British Aluminium Co., Ltd., have a number of different articles made from this light and strong material. These include cooking utensils, tubes, wires, cables, etc. There are also a number of pigs of the metal in the booth.

The Lightning Evaporator Co. of Dunham, Quebec, have one of their maple syrup evaporators set up all ready for use. The furnace is designed to burn either wood or coal, and the evaporator consists of a number of shallow vessels into which the maple syrup is poured. Mr. Len Emonds, of Smith's Falls, the Ontario agent for the company, is in charge of the booth.

The Clemens Electrical Corporation of Canada, with headquarters in Hamilton, are showing their electrical soldering irons, and as these irons work at a voltage of 8 volts, the necessary transformers are also included in the exhibit. An interesting feature of the booth is the J. C. refillable fuse, a very neat and economical type of this largely used article. The booth is in charge of Mr. R. C. Guest.

L'Air Liquide Society have a very ef-

A CROWD AT THE EXHIBITION GROUNDS

fective display of oxy-acetylene welding appartus, consisting of gas cylinders, torches of various kinds, and complete outfits made up ready for use. For those visitors who are not familiar with the class of work that can be done with these outfits, a lantern has been installed in the booth, which throws on a screen interesting illustrations of welding jobs. Mr. Turnbull and Mr. Godfrey are the representatives of the firm at the exhibition.

The Pratt & Whitney Company, Dundas, are showing a line of their tools, including cutters, drills, taps, effectively displayed in attractive show cases. Mr. Maver is in charge of the booth.

The Canadian General Electric Company have an electric welding exhibit on view, which they are demonstrating to anyone interested. The machines are the direct current type operating at 60 volts.

The Consumers Gas Company of Toronto have a number of gas furnaces of different styles on exhibition. These are for industrial purposes such as tempering tools, annealing etc. There are also various styles of gas torches and a brazing table autfit. These should be of interest to users of gas appliances.

The Dunlop Rubber Company, represented by J. R. Thompson, have a very effective display, consisting of a belt conveyor, elevator, and drive belt all in operation. The background of the booth represents a quarry in operation, showing the different uses to which rubber belting can be put in conveyor operations. They have also different types of rubber hose, and a full line of rubber goods.

The Allen GGeneral Supply Company, represented by Mr. Wilkes, are showing a number of power plant accessories designed to effect economy in fuel consumption. The well-known Venturi Feed Water Meter is the principal of these appliances, backed up by the Copes Boiler Feed Water Regulator, the Dwight CO_2 Indicator, and the Howell electric motor. In these days of high fuel costs, this exhibit should receive considerable attention.

The W. R. Sexton Boiler Setting Co. are displaying a full line of fire bricks, nonpareil grate bars and boiler settings. They have also a line of engine and pump packings, representing the William C. Wilson Co. in these lines. Mr. Sexton has charge of this exhibit.

The Thomas Davidson Manufacturing Company, of Montreal, have an exhibit of steel castings, made in their electric furnaces at Turcot. Prominent among these is a line of anvils, which attract considerable attention from visitors. A cast steel shaft in the rough state is also on view, with other products of the same material. The firm is represented by Mr. Flack the Toronto manager, and Mr. Wasson.

TWO BOOKS ON MACHINE AND FITTING SHOP PRACTICE

By GEORGE W. BURLEY, Wh. Ex. A.M.I. Mech. E.

These two books are published by Scott, Greenwood and Son, 8 Broadway, Ludgate, London, E.C.4., and comprise the following subjects, which are gone into in considerable detail.

Volume 1 takes up materials of construction, shop measurements, measuring instruments, gauging and gauges, setting out with tools and operations; the vice, the hammer and chisel, and the art of chopping; files, their forms and uses; and scrapers and scraping.

Volume 2 covers planing, shaping and slotting; drilling, boring and reaming; milling, and gear wheel cutting; lathe work, grinding and lapping; screw thread cutting, and interchangeable system of manufacture.

212 pages, and 194 illustrations, with 4 tables, comprise volume one, while 242 pages, with 238 illustrations and 9 tables forms volume No. 2.

These books have been written especially for engineering works' apprentices and college and technical school students for use in connection with their practical work.

Great attention has been placed on the actual working processes, operations, etc., rather than the machines themselves. This fact will be appreciated by student readers.

These books are both listed at the very reasonable price of six shillings net, and can be had direct from the publishers.

The American Malleable & Castings Association, Cleveland, have issued a book on Malleable Iron, which takes up the mechanical and physical properties of this material in an admirable manner. The composition of malleable cast iron is dealt with and the remainder of the book is devoted to the various physical and electrical properties which make malleable iron a useful material in the arts.

Messrs. Longmans, Green & Co., of New York and London, have just published a book by J. Mitchell, A.M.I.N.A., and edited by Edward L. Atwood, O.B.E., M.I.N.A., on Naval Architects' Data. The first pages of the book are devoted to formulae, tables, etc., which are in daily use by the naval architect. The following pages of the book are devoted to data sheets, in which all the particulars appertaining to calculations for a ship or a number of sister ships are collected together, with blank spaces opposite each one for the insertion of the figures. These are divided into sections, the first one being devoted to length, breadth, depth, speed, etc. Then comes numerals, midship sections, lines, estimating summary weights, rudder, bunkers, drafts, tonnage, freeboard, capacities of holds, shipbuilders' auxiliaries, engines, boilers, electrical installations, boats, etc. The book is printed on good paper and bound in cloth. It should, if filled up conscientiously, form a very valuable reference book for the naval architect and shipbuilder, in a compact and permanent form. The price is $3 net.

R. F. Baldwin, treasurer of the Oliver Machinery Co., Grand Rapids, Mich., will spend the week of August 25 on a fishing trip in Northern Michigan. He is an ardent fisherman.

H. R. Charlton, of the Grand Trunk publicity bureau, has been appointed to accompany H. R. H. the Prince of Wales while he is touring through Ontario on the Grand Trunk lines. Mr. Charlton has been the Company's representative on the various tours of visiting notables during the past twenty years. He was awarded the Order of the Sacred Treasure by the Emperor of Japan following the visit to Canada of the Prince Fushimi.

The S. S. Faraday, the largest cable laying vessel in the world, has just taken determined efforts of ventilating engin on a cargo of grain for overseas. The Faraday is over 20 years old and has laid practically every long distance cable in the world. During the war this ship put down a 1800-mile cable between Ireland and Newfoundland, and while on the work was escorted by a cruiser and a dozen patrol boats, succeeding in laying the cable on one trip, without a hitch.

About ten per cent advance has been made on transatlantic passenger rates, this being equal to $5 to $15 per trip. This action has been found necessary owing to the higher working costs due to the dock strikes in British ports, and the general advance in operating expenses. This new ruling went into effect or August 20.

According to the estimate of the British Advisory Committee of the Ministry of Reconstruction the existing airplane factories in England are capable of the production of 40,000 airplanes and 30,000 motors a year, and are able to supply spare parts for an air force of that size.

Electric Mine Hoists. What is said to be the first electrically driven mine hoist in the world was of 10-h.p. and installed at Aspen, Colorado, July, 1888. Contrasted with this is the hoist at the Crown Mines, South Africa, driven by two 2,000-h.p. electric motors.

Sydney Coal to Scandinavia.—The Furness-Withy Line recently made an experimental shipment of three thousand tons of coal to Norway. That the experiment proved successful is evident from the fact that an order for ten thousand tons has been received. This will be shipped in Norwegian steamers at the beginning of next month.

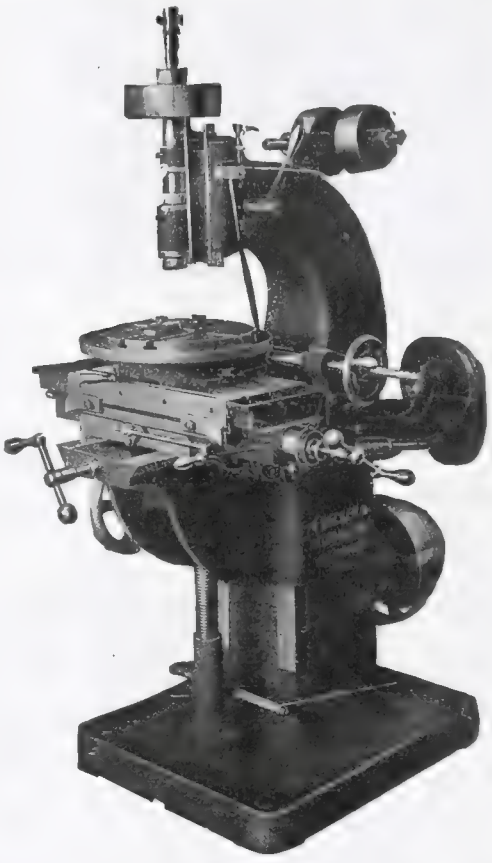
BECKER

Belt Driven Millers

The Machine that Gives the Smooth Finish

Stringent shortage of labor during the war put a premium on machinery of superior productive ability. Never was the capacity and value of Becker Millers better emphasized than during that period. And Becker Millers will always continue to demonstrate their ability to return maximum production for minimum expenditure of manual effort.

Send us blue prints of your work and other data and we will submit estimates on Becker production. Adopt this "safety-first" course; it may mean added profits to you.



The A. R. Williams Machinery Co.
LIMITED, TORONTO

Acid Electric STEEL CASTINGS

Acid Electric Steel Castings show superior ability to resist wear and crystallization. They are smooth in texture, free from Blow Holes, and machine perfectly. We specialize in

Railroad and Other High Grade Castings

up to 15 tons, any specification. Electric Steel Castings COST NO MORE than ordinary Steel Castings.

Prices on Application—Prompt Deliveries

The Thos. Davidson Mfg. Co., Limited
Steel Foundry Division, Lachine Canal
Head Office: 187 Delisle St. MONTREAL
Phone Victoria 1492

MORROW SCREWS MORROW

MORROWS

Whether you buy *Morrow* screws, nuts or twist drills, you *know* they are the very best that can be made anywhere. Then why not *insist* on *Morrow* make? (The jobbers will supply you, gladly). Every set and cap screw or nut (Plant No. 1), also every twist drill (Plant No. 3) is manufactured from material specially produced for the purpose. *Morrow* screws, nuts and drills may be higher in price but worth it because *you absolutely get more service.*

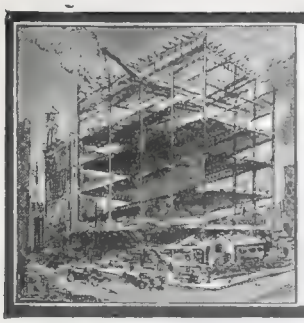
The Jobber Nearest You

deserves your support because he carries a stock of Morrow drills, screws and nuts for your convenience. *Ask him.*

Works at
Ingersoll - Canada

If you haven't used Ingersoll Files, you haven't used the best. *Get a sample from the jobbers and try it.*

MORROW DRILLS MORROW FILES MORROW NUTS MORROW



INDUSTRIAL NEWS

NEW SHOPS, TENDERS AND CONTRACTS PERSONAL AND TRADE NOTES

TRADE GOSSIP

Sydney, N.S.—The Sydney Foundry and Machine Company of Sydney, N.S., who conduct a large repair business in marine lines, are applying for a site upon which to build a dry dock for this port.

Fireman Scalded.—Through the blowing off of a cap on the boiler of the Smith Manufacturing Company, East Front Street, Toronto, a fireman was badly scalded about the face and arms. The man's name was John Smith, and he is 55 years old. He was removed to the St. Michael's Hospital.

Canners' New Offices.—The Dominion Canners have purchased new office premises in Hamilton. They have bought the old Bell Telephone building on Hughson street, the price being reported to be over $50,000. Their present offices are in the Landed Banking & Loan Building.

Steel Employees Want More.—Some of the employees of the Steel Company of Canada at their Hamilton works are demanding increases in wages. These men were not included in the recent 10 per cent. advance. The firemen are claiming an advance of 13½ cents an hour.

Lake Huron Steel Corporation.—A site has been secured at Goderich for this concern and all other preliminaries have been settled. The site comprises 250 acres along the shores of Lake Huron. The company undertakes to spend $2,000,000 in the first year, and $6,000,000 in the second year, in establishing its plant. The equipment will include six electric furnaces.

Improved Employment Conditions:—Reports to the Department of Labor from employers in the provinces of Ontario and Quebec show improved conditions. During the week ending August 9th, 2,686 firms increased their employees by 591, an increase of .2%, and a further increase was expected the following week which would bring it to 6 per cent.

Surveying for Hydro-Electric. — A start has been made on the long projected line from Port Colborne to Bridgeburg, the Hydro surveyors having started surveying the proposed route. The party have progressed as far as Fort Erie and are expected to finish shortly. As soon as the survey is complete it will be sent to the headquarters of the Hydro Commisison, and the purchase of the right of way will be taken up at once.

New C.P.R. Locomotives.—The new locomotives put into commission by the Canadian Pacific Railway are powerful machines. They will be operated on the Montreal to Toronto division, and are capable of hauling a train of 100 cars. They are in fact doing this daily between Smith's Falls and Montreal. The boilers hold over 11,000 gallons of water, and between Smith's Falls and the Outremont yards they burn 16 tons of coal.

Port Colborne.—The body of Alex. Beck, badly mutilated, has been found in the hold of the barge Quebec, but there has as yet been no sign of the body of Arthur Dunlap. Both men were missing from the time of the disaster at the grain elevator here. The barge was floated by the Clarence Lebau wrecking outfit from Toledo, and is now at the Government elevator dock. A considerable quantity of grain is still on board. The vessel is badly damaged, and a large amount of debris is on her decks.

An All-British Wireless.—The Imperial Investigation Board are now busy developing a scheme by which the whole Empire will be linked together by wireless. The invention is to link the Dominions to each other as well as to Great Britain, thus bringing into closer communication some of the further away dependencies, which have hitherto been rather out of it. This work will complete the work commenced by Sir Sandford Fleming many years ago with the submarine cable.

Stands by the Ferry Co.—Ex-Mayor Charles R. Tuson, of Windsor, is circulating a petition to withdraw all objections to renewal of the Windsor Ferry Co's license to operate between Windsor and Detroit. Mr. Tuson, in addressing the Chamber of Commerce, urged that the City Council were wrong in withholding their support from the Ferry Company in the latter's endeavor to get an extension of their franchise from the Dominion Government. He claimed that the slight increase in fare had met with no opposition from the public.

Shelburne.—Detroit, Brantford, and Toronto men are interested in the development of the oil or gas fields in the vicinity of Markdale, Grey County. A company is being organized under the name of the Detroit Canadian Oil and Gas Company, Limited, the capital being $60,000. The public will be offered $30,000 in $50 shares, and as soon as this amount is in the treasury, drilling will be commenced. Machinery capable of drilling to a depth of 4,000 feet has already been ordered. It is claimed that there is a rich field here awaiting exploitation.

The British Preference.—The list of goods to which preference will be extended if produced in the British Empire has been announced. Tea, cocoa, coffee, chicory, currants, dried and preserved fruits, saccharine, motor spirits and tobacco pay five-sixths of the full rate of duty. Motor cars, musical instruments, clocks, watches and cinematograph films pay two-thirds. Wine not exceeding 30 degrees proof spirit will pay 60 per cent. of the full rate, and wine exceeding 30 degrees 66 2-3 per cent. Unbottled still wines, 50 per cent. of the full rate of the additional duty will be charged. The preference will be extended on spirits by increasing the duty on spirits not produced in the Empire, four shillings per gallon on perfumed spirits, three shillings and fourpence a gallon on liquors, and half a crown per gallon on spirits of other descriptions.

TENDERS

The Hespeler Water Commission want tenders for the laying of 5,448 lineal feet of water mains. Tenders addressed to M. E. Jardine, Town Clerk, will be received up to August 30, and plans and specifications can be obtained from the office of the town clerk.

The Department of Public Works are calling for tenders for the construction of a wharf at Boisdale, N.S. Tenders will be received until 12 noon, September 3, and plans and specifications can be seen at the office of the district engineer, North Sydney, or at the Post Office, Boisdale, N.S.

The Department of Public Works are calling for tenders for the repair of the wharf at St. Jean D'Orleans, Montmorency County, Quebec. Tenders will be received until September 3rd, and plans and specifications can be obtained from the district engineer, Post Office, Quebec; Shaughnessy Building, Montreal and Post Office, St. Jean d'Orleans.

The Department of Public Works of Vancouver is calling for tenders for the erection and completion of a bridge on River Road, near Haney B.C. Plans and specifications can be obtained from the office of the District Engineer, Court

GEOMETRIC

"YOU CAN'T BEAT 'EM" SELF-OPENING DIE HEADS

It is not the manufacturers of Geometric Self-Opening Die Heads who make this statement, but the users of the tools.

This is the reason that besides being the originators, we are known as the

LARGEST AND BEST KNOWN MANUFACTURERS OF AUTOMATIC THREADING TOOLS

The big question is: Have you applied Geometric Screw Thread Cutting Tools to your threading work?

THE GEOMETRIC TOOL COMPANY

NEW HAVEN CONNECTICUT

Canadian Agents: Williams & Wilson, Ltd., Montreal; The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg and St. John, N.B.

REGISTERED U.S. PAT. OFFICE NOS. 50932-61344
CANADIAN PAT. OFFICE NO. 44

"HAWK VANADIUM" TOOL STEEL

Remarkable in its glass Hardness, Toughness and Cutting Efficiency.

Will give twice the cut of a regular tool steel at one grinding.

Order "Hawk Vanadium" for your End Mills and cutters. Once known—always used.

Large Stock. Prompt Shipment.

Write for full particulars to

Hawkridge Brothers Company

Main Office and Warehouse:
303 Congress Street, Boston, Mass
Storehouses Malden Mass.

STEEL
OF EVERY DESCRIPTION
SEND US YOUR ENQUIRIES.

MAPLE LEAF
STITCHED COTTON DUCK
BELTING
DOMINION BELTING CO. LTD
HAMILTON CANADA

Upon the Health of your employees depend your profit and production

Don't be contented with half-way goodness or makeshift drinking arrangements.

Throw out the germ-laden Drinking Cup !

Give your men a clean drink

PURO **SANITARY DRINKING FOUNTAIN**

(MADE IN CANADA)

Allows just the proper amount of cool, clean fresh water to come through the bubbler. No spurting, overflowing, no loss. "Puro" regulates itself. "Puro" saves 35% on water bills, too. You can attach it in a few minutes. Tell us how many men how many departments and we'll tell you how much the cost will be.

Puro Sanitary Drinking Fountain Co.

Canadian Agents
McKENZIE BROS.
18 St. Alexis St., Montreal, P.Q.

BERTRAMS LIMITED
SCIENNES EDINBURGH
Machine Tools
FOR SHIPYARDS ETC

DIAMOND OVENS

OVENS

Japanning and Varnishing Ovens heated by Gas, Electricity, Steam or Coal. Kernchen Siphonage Ventilators, Bakers' Ovens, trucks, casters, etc. Write for Booklet.

Brantford Oven & Rack Co., Ltd.
Brantford, Canada.

DIAMOND OVENS

House, Vancouver, B.C., or from the Department of Public Works, Victoria, B.C.

The City of Moose Jaw wants tenders for the laying of sewer and water mains. Tenders must be in by Saturday, 30th inst. and plans and specifications may be obtained at the office of the city engineer.

MARINE

Quebec.—The steamer Glen Allen, belonging to the Kirkwood Line, on Montreal, has been put into drydock for an examination, after having scraped her bottom on the rocks a few miles west of the Quebec Bridge.

Quebec.—While entering Quebec harbor the steam barge Captain Dan, commanded by E. Gamache, struck a wharf and sank before she could be beached. The cook, Mrs. Annie Taylor, was drowned, but the rest of the crew were rescued from a capsized rowboat on which they had found refuge.

Quebec.—The salvage tug Lord Strathcona has been despatched to the aid of the steamer Admiral Hastings, which left Montreal for England recently, and is now ashore on Baggot Bluff, the south point of Anticosti Island. She reports being hard and fast, and unable to refloat with her own power.

Quebec.—S.O.S. calls were received from the steamer Verdullia, which had struck an iceberg in the straits of Belle Isle, while on a voyage from Quebec to England. After the first calls were received, a later one gave the information that the vessel was apparently not badly damaged, and was proceeding on her voyage.

Port Colborne.—While towing the steamer Glen Lyon down the canal to load paper at the Ontario Paper Mill wharf, the tug Alert caught on a shoal, and before the hawser could be released she was drawn under on her side and sunk. The crew all rushed to the high side and jumped when she commenced to capsize, and were rescued with some

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difficulty from the canal. The Alert will be raised.

Prince Rupert, B.C.—The new car ferry slip at Prince Rupert has been commenced and is expected to be completed in October at a cost of $50,000. It will be built to accommodate a car barge carrying nine loaded cars, and three cars at a time can be unloaded or loaded.

Halifax, N.S.—The steamer "Chaudiere," of the Royal Mail Steam Packet Company's fleet, struck a rock going into Hamilton, Bermuda. There is a narrow channel between two rocks which come close to the surface and the vessel's starboard side struck one of these, tearing a hole in it. She had about 100 passengers for Barbadoes and Demerara, and these will have to be transhipped as she is too badly damaged to continue the voyage.

Collingwood.—The former lake steamer "Codorus" has been salved from the rocks at Escamanick Point in the Gulf of St. Lawrence by Capt. Reid of Port Huron. The vessel, which was formerly owned by the Anchor Line on the Great Lakes, was taken over by the United States Shipping Board and taken through the canals to the sea after being cut in two. She was joined together in Montreal, but her career on the salt water was brief. She was given up as a total loss, but after five weeks' work Capt. Reid was successful in floating her. He did the work on a percentage basis.

Halifax.—Six men of the crew of the schooner Francis A. were lost when the schooner was rammed and sunk by the steamer Lord Downshire, belonging to the Ulster Steamship Company of Belfast. The collision occurred while the schooner was fishing about 120 miles south of Halifax, in a thick fog, and the Lord Downshire was bound from Baltimore to Belfast with a general cargo. After the collision the steamer lowered a lifeboat and rescued fourteen of the crew of twenty, but the remaining six were never seen. The names of the men who were drowned were Capt. Percy Ross and Ainslie Ross his brother, both of Broad Cove, N.S.; Tom Muise, Belleville, N.S.; James Gardner, Argyll, N. S.; Joe Harris, Yarmouth, and Fred Fitzgerald, no address known.

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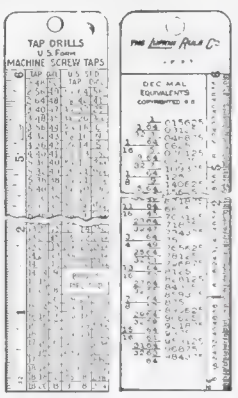

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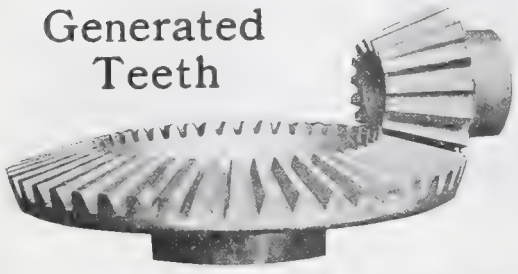

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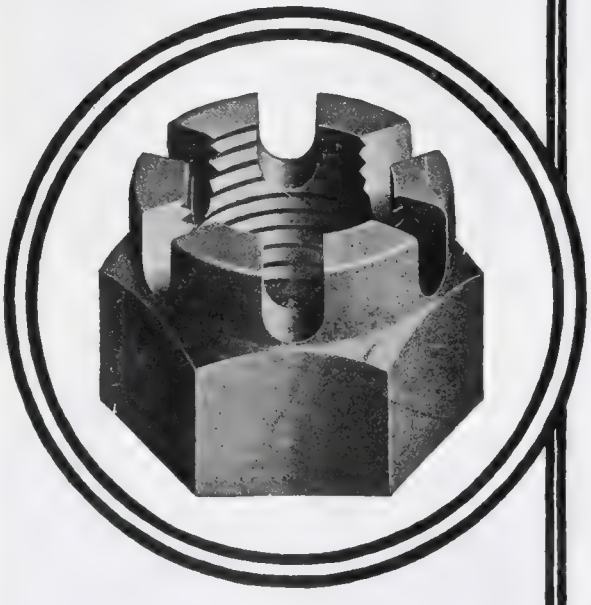

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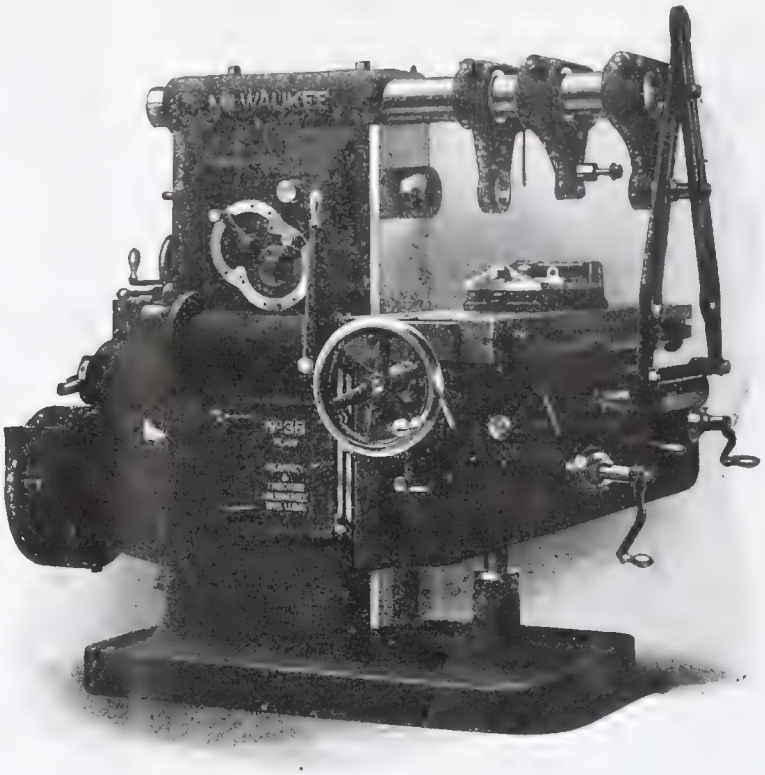

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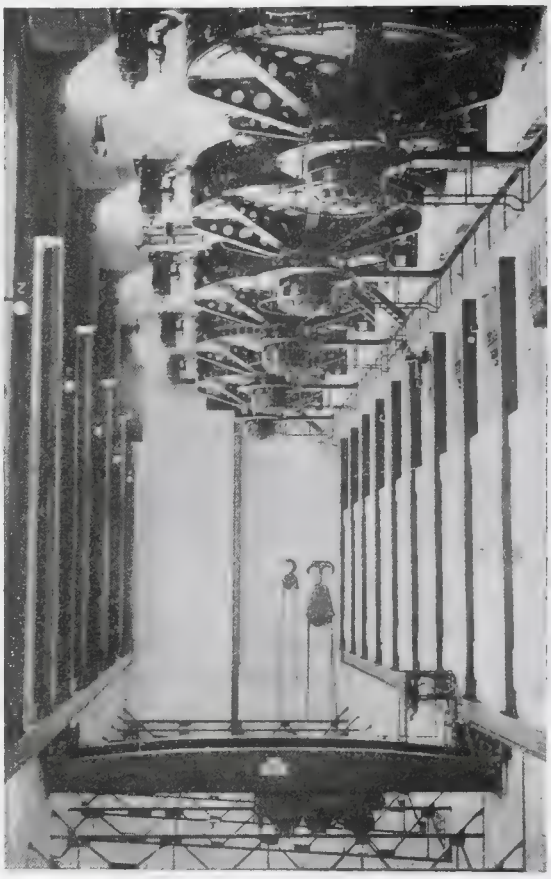

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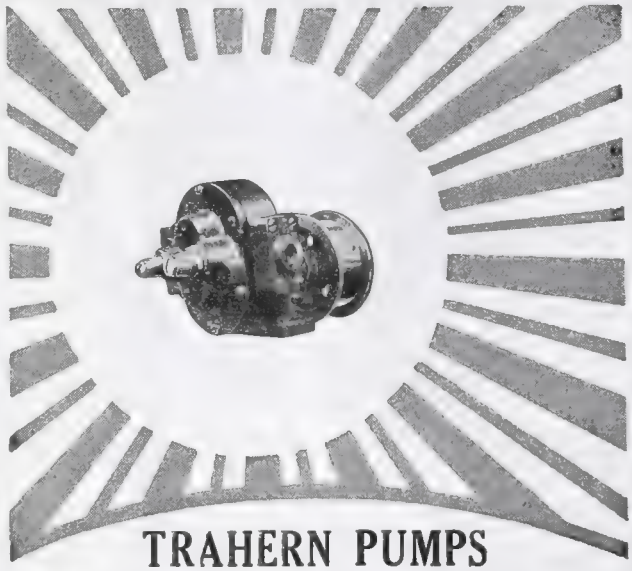

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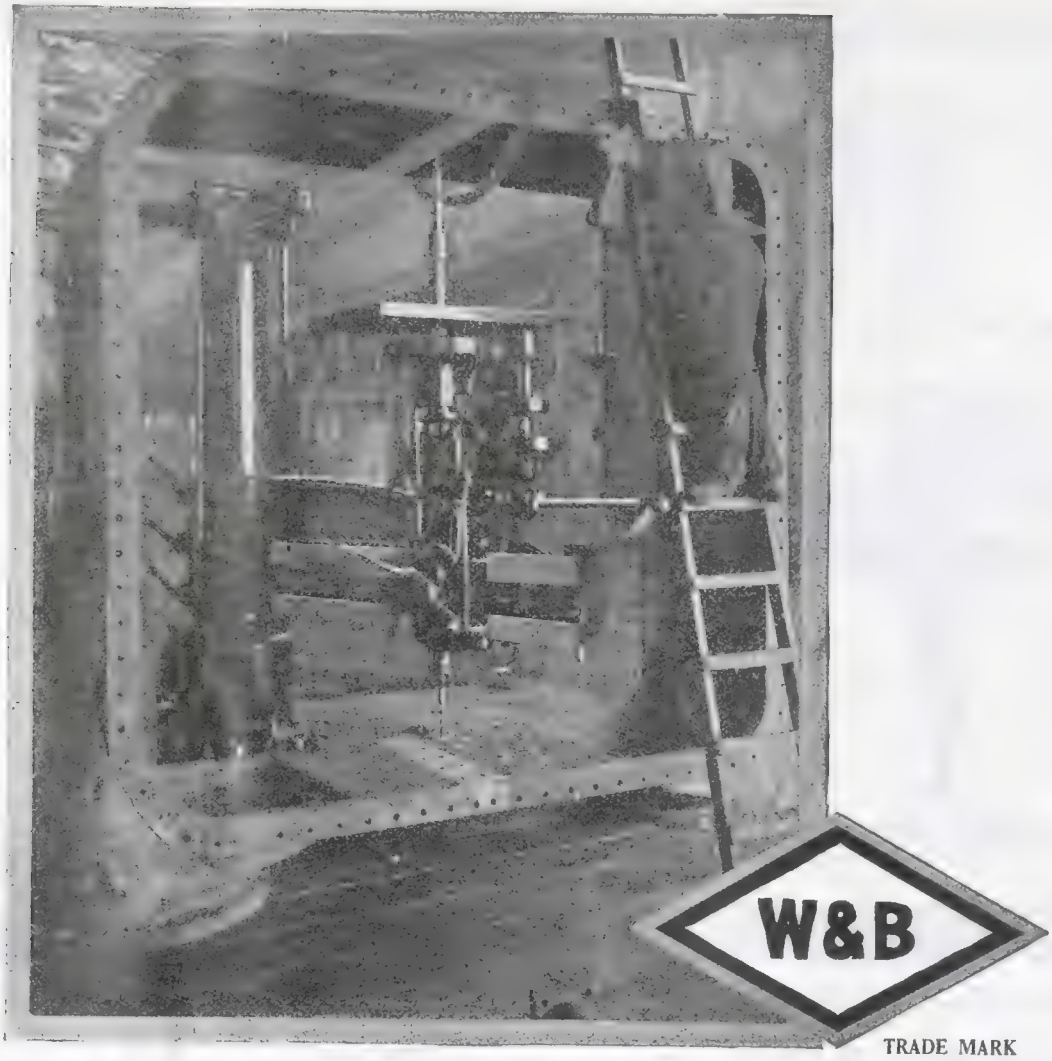

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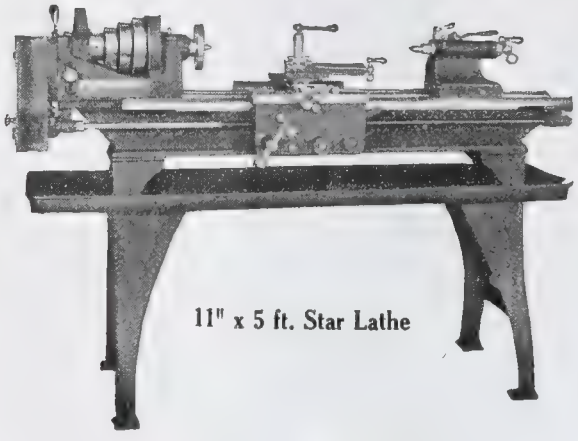

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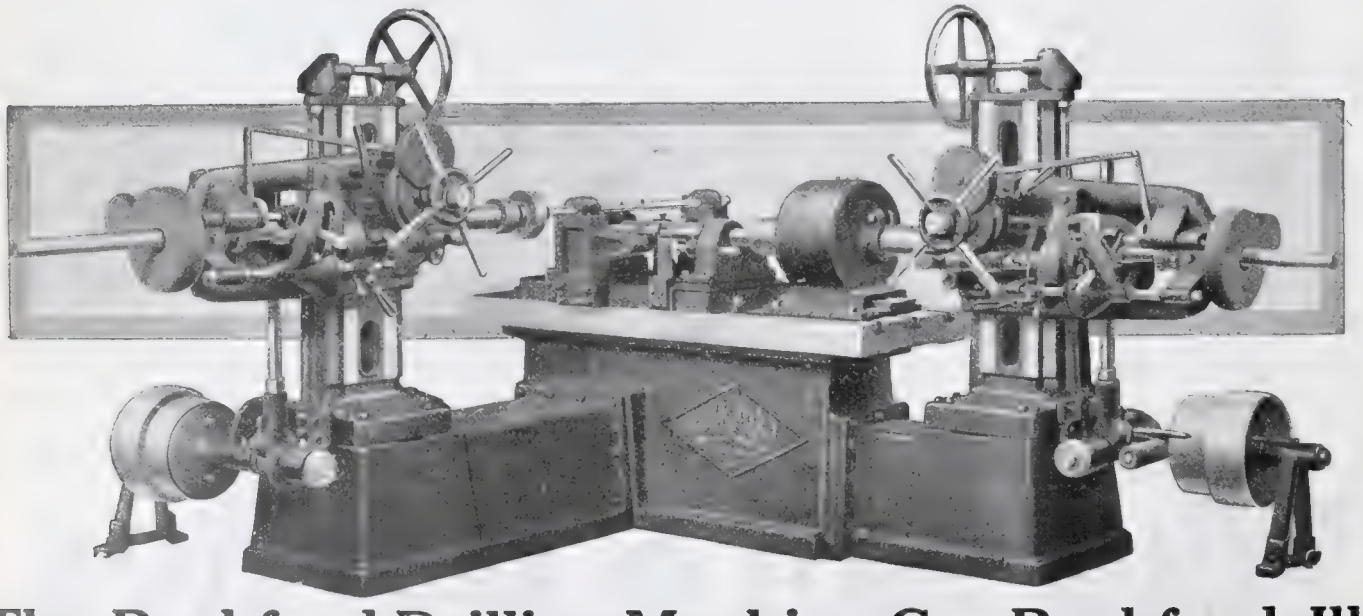

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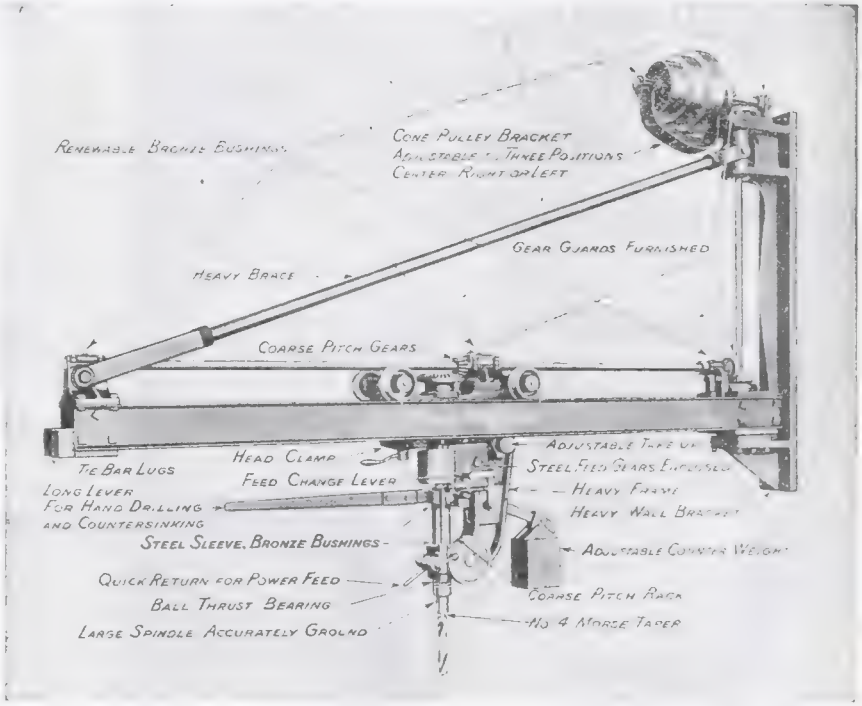

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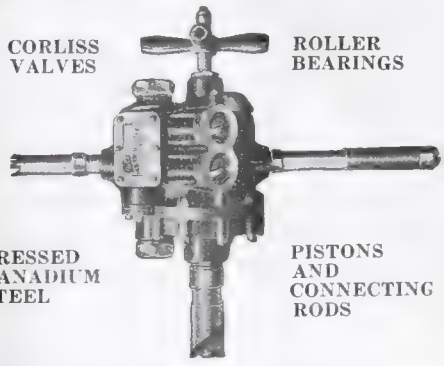

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(Licensed under Burke Universal Motor Patent)

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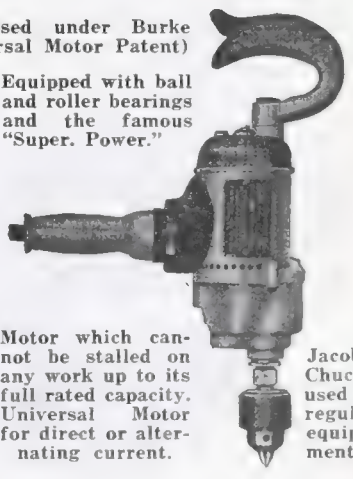

Motor which cannot be stalled on any work up to its full rated capacity. Universal Motor for direct or alternating current.

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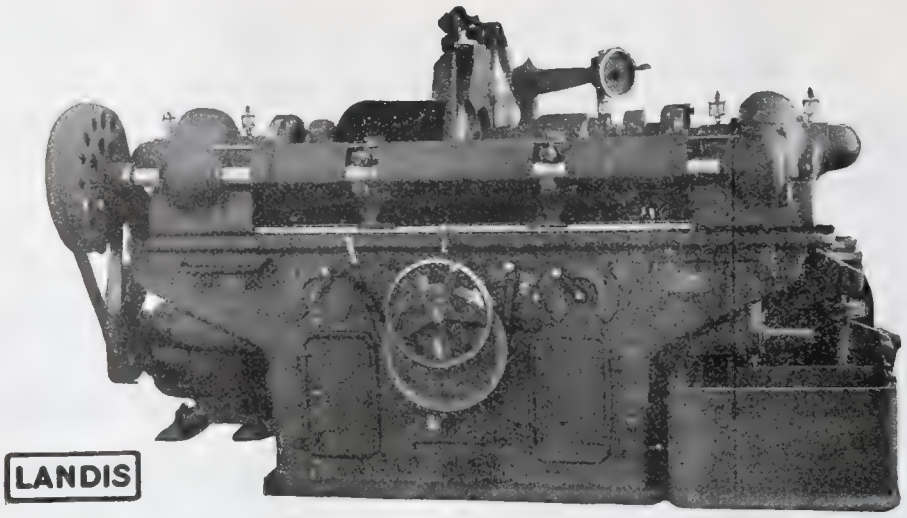

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A new Landis Crank Grinding Machine with the old traditions of Landis accuracy and production.
The crank shafts are driven from both ends, both right and left hand crank heads being geared together. A micrometer sliding adjustment with graduated dial, on the crank carrying fixtures, adjusts the machines for the grinding of different throws.

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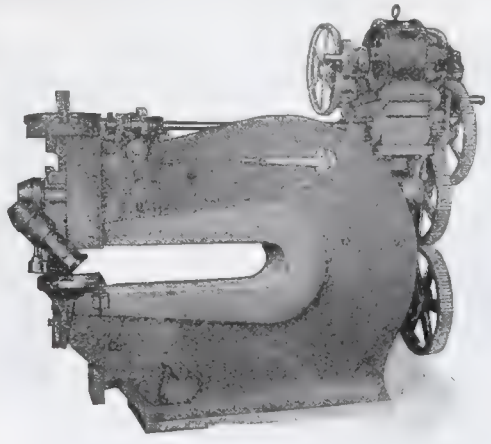

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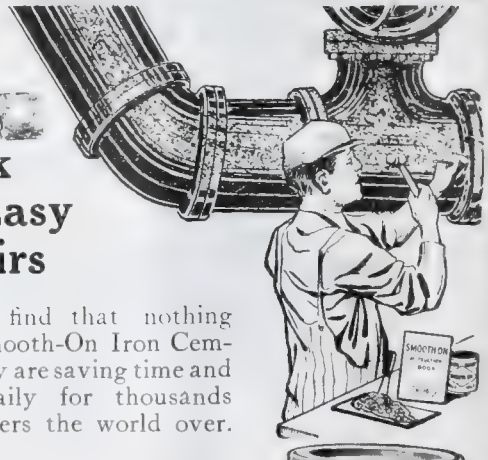

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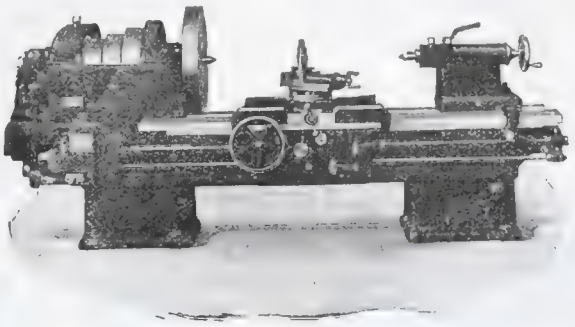

Specifications include 3-step cone, double back gear, semi-quick change gear lathe, built on 10 ft. bed. This lathe also furnished with quick-change gears. Bed lengths available: 10, 12, 14, 16, 18 and 20 feet.

The Sidney Line comprises 15-inch, 17-inch, 19-inch, 25-inch, 27-inch, 30-inch and 36-inch lathes, which are adaptable to the finest tool room work or the heaviest duty shipyard or factory rapid production work.

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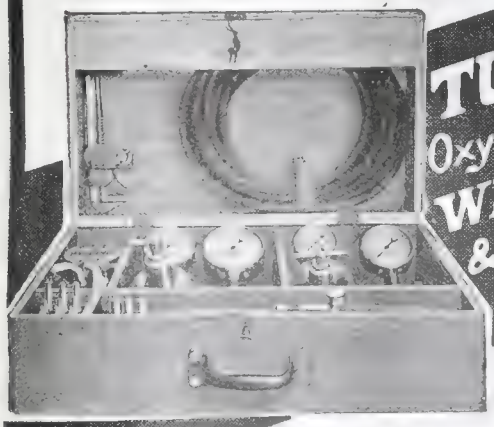

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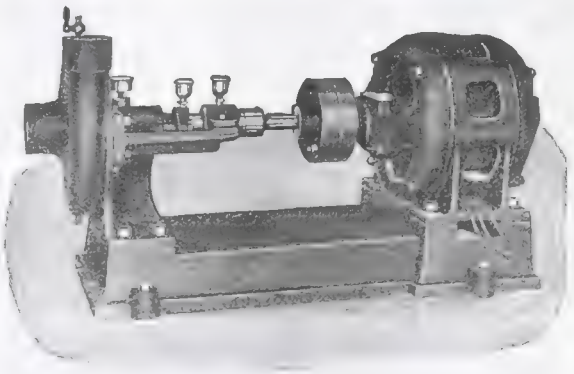

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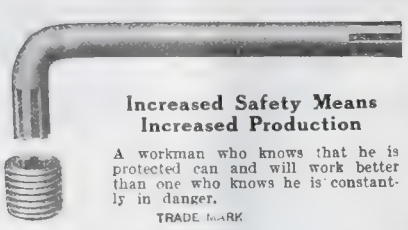
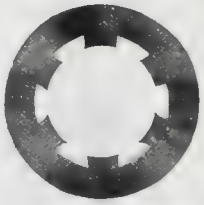

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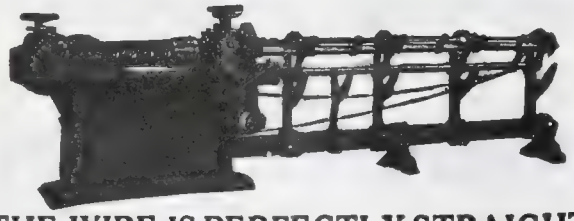
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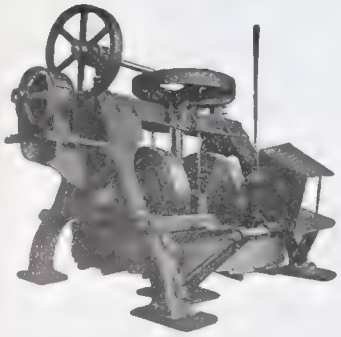
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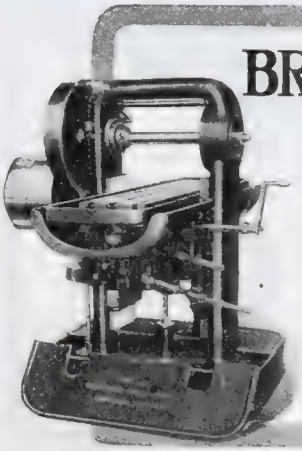
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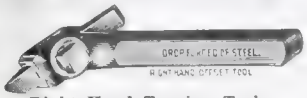

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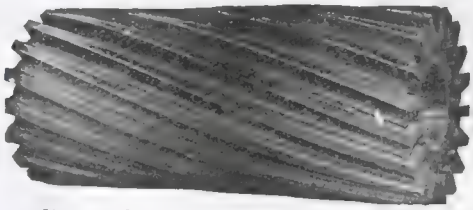

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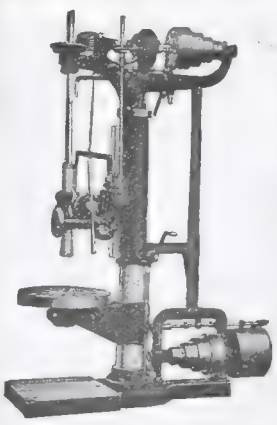

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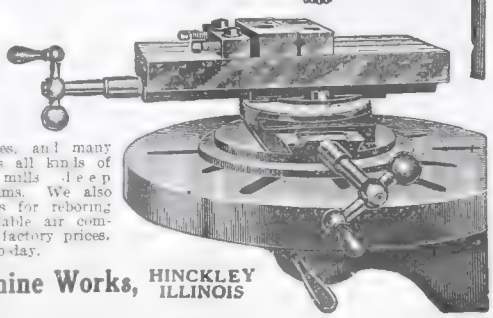

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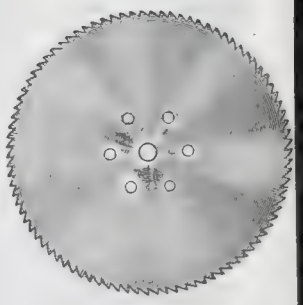

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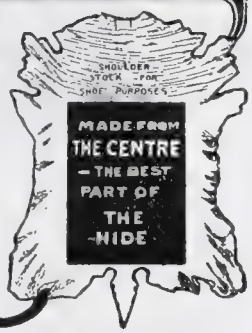

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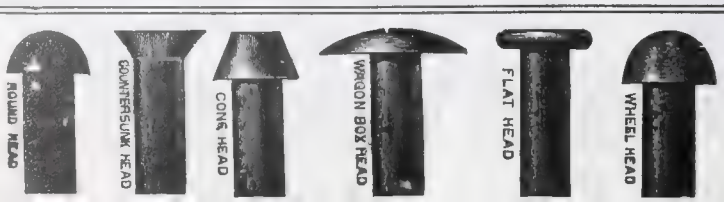

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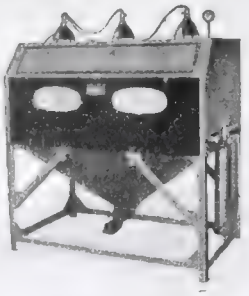

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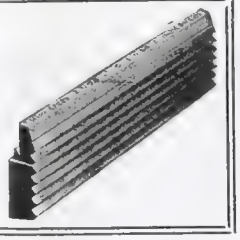

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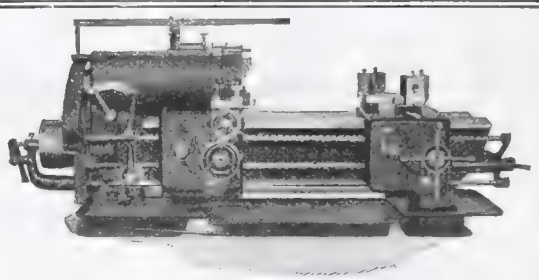

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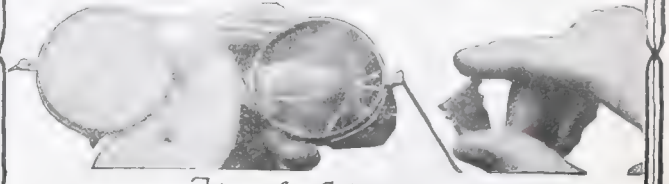

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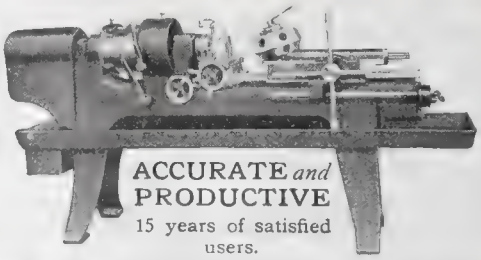

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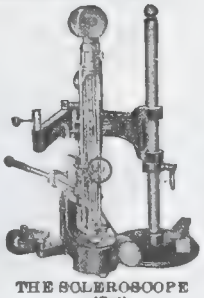

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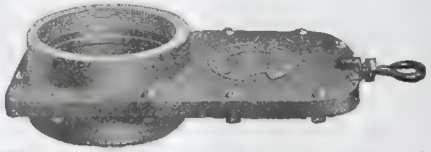

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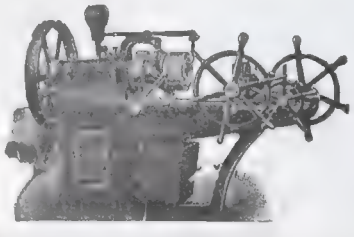

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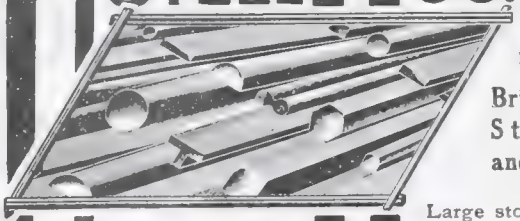

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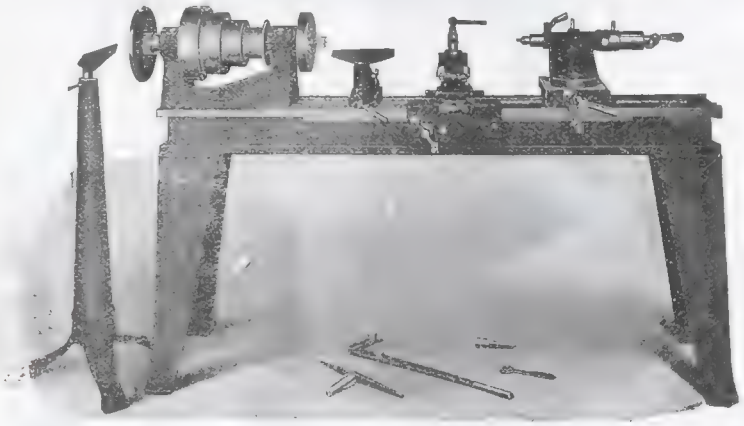

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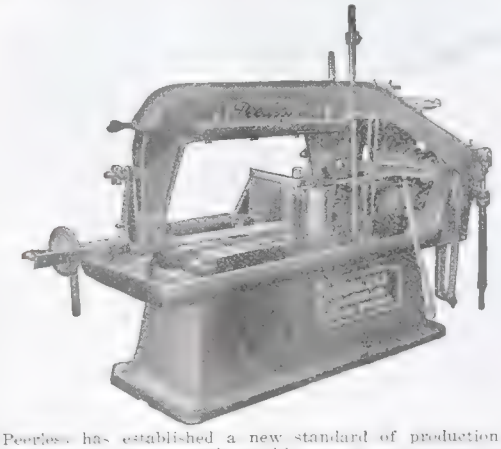

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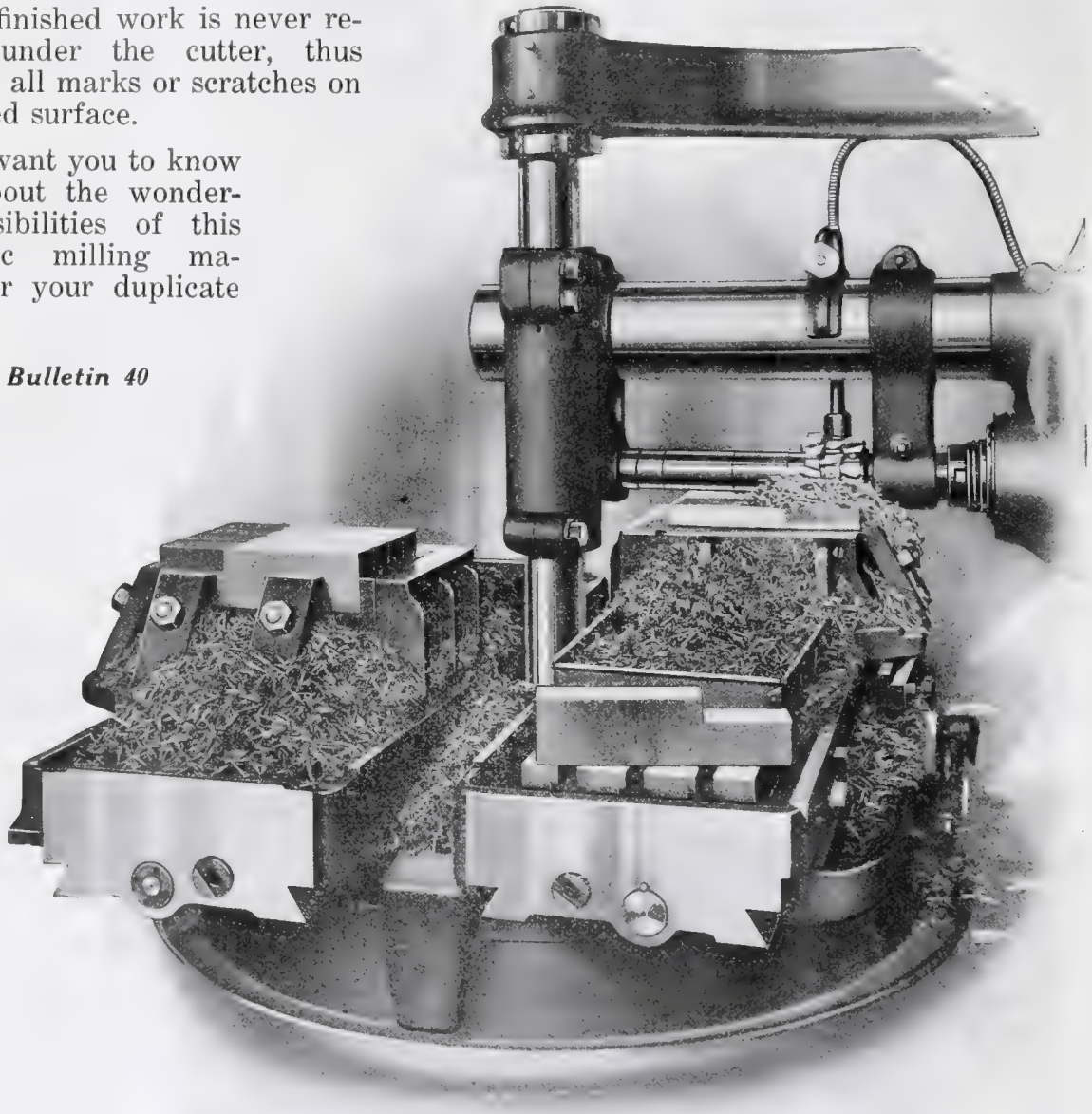

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Landis Tool Co., Waynesboro, Pa.
Nat. Automatic Tool Co., Richmond, Ind.
Niles-Bement-Pond Co., New York.
Rockford Drilling Mach Co., Rockford, Ill

DRILLING MACHINES, RADIAL AND TURRET
John Bertram & Sons Co., Dundas.
Canadian Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Henry & Wright Mfg. Co., Hartford.
Landis Tool Co., Waynesboro, Pa.
Niles-Bement-Pond Co., New York.
Williams & Wilson, Limited, Montreal.

DRILLING MACHINES, SENSITIVE
Bilton Mach. Tool Co., Bridgeport, Conn.
W. F. & John Barnes Co., Rockford, Ill.
Canadian Fairbanks-Morse Co., Montreal.
Canadian Machinery Corp., Galt, Ont.
Geo. F. Foss Mch. & S'ply Co., Montreal
Garlock-Walker Mach. Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Landis Tool Co., Waynesboro, Pa.
Niles Bement Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
United States Mach. Tool Co., Cincinnati
Williams & Wilson, Limited, Montreal.

DRILLING MACHINES, UPRIGHT AND HORIZONTAL
Aurora Tool Works, Aurora, Ind.
Blomquist-Eck Mach. Co., Cleveland, O.
John Bertram & Sons Co., Dundas.
Garlock-Walker Mach. Co., Toronto, Ont
Can. Blower & Forge Co., Kitchener.
Canada Mach. Corp., Galt, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Fry's (London), Ltd., London, Eng.
Garlock-Walker Mach. Co., Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
A. B. Jardine & Co., Hespeler, Ont.
Landis Tool Co., Waynesboro, Pa.
R. McDougall Co., Galt.
Nat. Automatic Tool Co., Richmond, Ind.
Rockford Drilling Mach. Co., Rockford, Ill
Niles-Bement-Pond Co., New York.
Silver Mfg. Co., Salem, Ohio.
A. R. Williams Machinery Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

DRILLING MACHINES, SPECIAL
Hoefer Mfg. Co., Freeport, Ill.

DRILLING MACHINES, WALL RADIAL
Lynd-Farquhar Co., Boston, Mass.
Wickes Bros, Saginaw, Mich.

DRILLING POSTS
Aikenhead Hardware Co., Toronto, Ont.
Keystone Mfg. Co., Buffalo, N.Y.
Rice Lewis & Son, Toronto, Ont.
Silver Mfg. Co., Salem, Ohio.

DRILLS, BENCH
Aikenhead Hardware Co., Toronto.
W. F. & John Barnes Co., Rockford, Ill
Can. Blower & Forge Co., Kitchener.
Can. Fairbanks-Morse Co., Montreal.
Geo. F. Foss Mch. & S'ply Co., Montreal
Fry's (London), Ltd., London, England
Garlock-Walker Machinery Co., Toronto.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
U.S. Electrical Tool Co., Cincinnati, O.
Williams & Wilson, Ltd., Montreal, Que.

DRILLS, CENTRE
Aikenhead Hardware Co., Toronto, Ont.
Cleveland Twist Drill Co., Cleveland.
Morrow Screw & Nut Co., John, Ingersoll
Morse Twist Drill & Machine Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., Akron, O.
Wilt Twist Drill Co., of Can., Walkerville
Williams & Wilson, Ltd., Montreal, Que.

DRILLS, BLACKSMITH AND BIT STOCK
Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener.
Cleveland Twist Drill Co., Cleveland.
Geo. F. Foss Mch. & S'ply Co., Montreal
A. B. Jardine & Co., Hespeler, Ont.
Morrow Screw & Nut Co., John, Ingersoll
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., Akron, O.
Wilkinson & Kompass, Hamilton, Ont.
Wilt Twist Drill Co. of Can., Walkerville

DRILLS, CARBON
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Marshall, Son & Bunney, Toronto.
John Morrow Screw & Nut Co., Ingersoll

DRILLS, ELECTRIC, PORTABLE
Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener.
Boker & Co., Inc., H., Montreal, Que.
Cincinnati Electrical Tool Co., Cincinnati
Geo. F. Foss Mch. & S'ply Co., Montreal
Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.
Pilot Steel & Tool Co., Montreal, Que.
Prest-O-Lite Co., Inc., Toronto, Ont.
U. S. Electrical Tool Co., Cincinnati, O.
A. R. Williams Mach. Co., Toronto.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Ltd., Montreal, Que.

DRILLS, EMERY
Garlock-Walker Mach. Co., Toronto, Ont.

DRILLS, HIGH SPEED TWIST
Aikenhead Hardware Co., Toronto, Ont.
Armstrong-Whitworth of Can., Montreal.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Butterfield & Co., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland.
Canadian Fairbanks-Morse Co., Montreal
H. A. Drury Co., Montreal.
Geo. F. Foss Mch. & S'ply Co. Montreal
McKenna Brothers, Pittsburgh, Pa.
Marshall, Son & Bunney, Toronto.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
W. F. & John Barnes Co., Rockford, Ill
Plewes, Ltd., Winnipeg, Man.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Montreal.
Taylor J. A. M., Stair Bldg., Toronto.
Whitman & Barnes Mfg. Co., Akron, O.
Wilt Twist Drill Co. of Can., Walkerville
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Ltd., Montreal, Que

DRILLS, OIL TUBE
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.

DRILLS, PNEUMATIC
Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland Pneumatic Tool Co., Toronto.
Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.
Williams & Wilson, Limited, Montreal.

DRILLS, PNEUMATIC CORNER
Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto.
Independent Pneumatic Tool Co., Chicago.

DRILLS, RATCHET AND HAND
Aikenhead Hardware Co., Toronto, Ont.
Armstrong Bros. Tool Co., Chicago, Ill.
Can. Blower & Forge Co., Kitchener, Ont.

NATCO

On Flange Work

The drilling of 15 Rear Axle Truck Housings is completed every hour. Each housing has 10 holes 1⅜ in. deep, which are drilled in one operation by NATCO

The Maxwell Motor Company of Newcastle, Indiana, gives the information in this instance.

The machine is equipped with the NATCO patented feature—independent change of speed for each spindle—making it possible to drill, ream, tap, counterbore or spotface different size holes in one operation. Greater production, lowered costs and dependable accuracy are NATCO results whenever the work calls for operations on more than one hole.

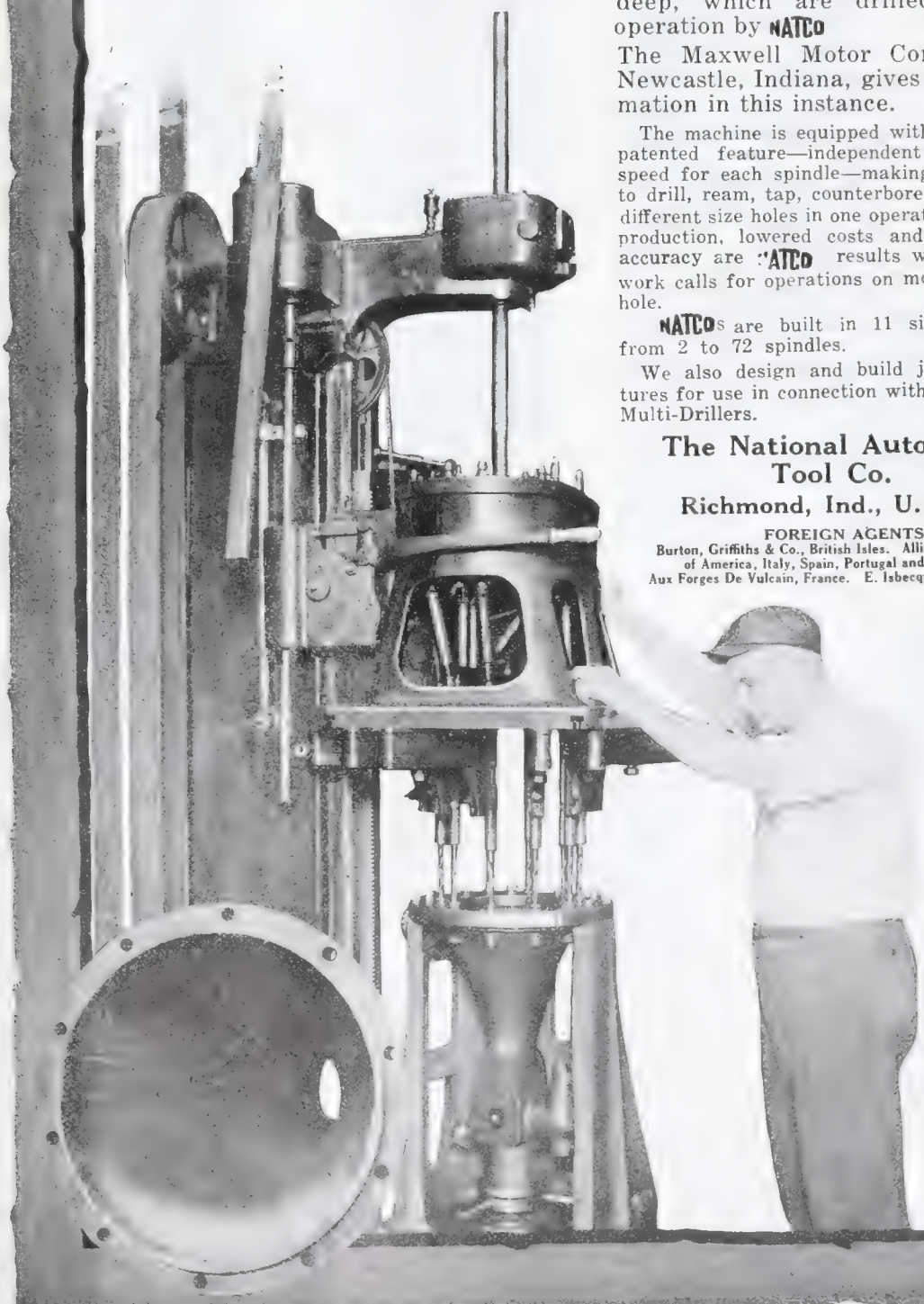
NATCOs are built in 11 sizes ranging from 2 to 72 spindles.

We also design and build jigs and fixtures for use in connection with the NATCO Multi-Drillers.

The National Automatic Tool Co.

Richmond, Ind., U. S. A.

FOREIGN AGENTS:
Burton, Griffiths & Co., British Isles. Allied Machinery Co. of America, Italy, Spain, Portugal and Switzerland. Aux Forges De Vulcain, France. E. Isbecque & Co., Belguim.



There's a Drill Speed For Every Need

Canadian Fairbanks-Morse Co., Montreal.
Cincinnati Electrical Tool Co., Cincinnati.
Cleveland Twist Drill Co., Cleveland.
Garlock-Walker Mchy. Co., Toronto, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney Co. Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., Akron, O.
Wilt Twist Drill Co. of Can., Walkerville.

DRILLS, ROCK

Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland Pneumatic Tool Co., Toronto.
The Foss Mchy. & Supply Co., Montreal.
A. R. Williams Machy. Co., Toronto.

DRILLS, TRACK

Cleveland Twist Drill Co., Cleveland
The Foss Mchy. & Supply Co., Montreal.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Wilt Twist Drill Co. of Can., Walkerville.

DRINKING FOUNTAINS, SANITARY

Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

DRIVES, CHAIN

See Belting, Chain.

DRIVING TOOLS

The Thos. Pink Co., Ltd., Pembroke, Ont.

DRY CLEANING SYSTEM

Bowser & Co., Inc., Fort Wayne, Ind.

DRYERS, SAND

Pangborn Corporation, Hagerstown, Md.

DRYING APPLIANCES

Baird Machine Co., Bridgeport, Conn.

DRUM CONTROLS

Elec. Steel & Metals, Ltd., Welland, Ont.

DUMP CARS

Canadian Fairbanks-Morse Co., Montreal.
MacKinnon Steel Co., Sherbrooke, Que.

DUST EXHAUSTER, ARRESTER SYSTEM

Pangborn Corporation, Hagerstown, Md.

DUST HANDLING EQUIPMENT

Pangborn Corporation, Hagerstown, Md.

DUST SEPARATORS

Can. Blower & Forge Co., Kitchener, Ont.

DYNAMOS AND ELECTRICAL SUPPLIES

Canadian Fairbanks-Morse Co., Montreal.
Lancashire Dynamo & Motor Co., Ltd., Toronto.
MacGovern & Co., Montreal, Que.
A. R. Williams Machy. Co., Toronto.

ELECTRICAL SUPPLIES

Can. General Electric Co., Toronto, Ont.

ELECTRIC FURNACE

Electric Steel & Metals, Ltd., Welland.
General Steel Co., Milwaukee, Wis.

ELECTRICAL RESISTANCE MATERIALS, NICHROME, KROMORE, CHROMAX, CLIMAX, NICKEL, SILVER, ADVANCE.

Can. Driver-Harris Co., Walkerville, Ont.

ELEVATOR, ENCLOSURES

Volta Mfg. Co., Welland, Ont.
Canada Wire & Iron Goods Co., Hamilton

ELEVATOR WEIGHTS

Katie Foundry, Galt, Ont.

ELEVATORS AND BUCKETS

Can. Link-Belt Co., Toronto, Ont.
Curtis Pneumatic Machy. Co., St. Louis.
Williams & Wilson, Ltd., Montreal, Que.

ELEVATING AND CONVEYING MACHINERY

Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Williams & Wilson, Ltd., Montreal, Que.

EMBOSSING PRESSES

Oliver Machinery Co., Grand Rapids, Mich

EMERY GRINDERS (PNEUMATIC)

Cleveland Pneumatic Tool Co., Toronto.
Ford-Smith Machine Co., Hamilton, Ont.

EMERY AND EMERY WHEELS

Brantford Emery Wheel Co., Brantford, Canada
The Foss Mchy. & Supply Co., Montreal.
Garvin Machine Co., New York.
Canadian Fairbanks-Morse Co., Montreal.
Canada Emery Wheels Co., Hamilton.
Ford Smith Mach. Co., Hamilton, Ont.
Rice Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Montreal.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Ltd., Montreal, Que.

EMERY WHEEL DRESSINGS

Wheel Trueing Tool Co., Windsor, Ont.

END MILLS

John Morrow Screw & Nut Co., Ingersoll

ENGINES, STEAM, GAS, GASOLINE

Canadian Fairbanks-Morse Co., Montreal.
Johnson Mach. Co., Carlyle, Manchester, Conn.
MacGovern & Co., Montreal, Que.

ENGINES, HORIZONTAL AND VERTICAL

Johnson Mach. Co., Carlyle, Manchester, Conn.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

ENGINES, MARINE

Can. Ingersoll-Rand Co., Sherbrooke, Que.

ENGRAVERS

Pritchard-Andrews Co., Ottawa.

ESCUTCHEON PINS

Parmenter & Bulloch, Gananoque, Ont.

EXHAUST HEADS AND HOODS

Can. Blower & Forge Co., Kitchener, Ont.
Canadian Fairbanks-Morse Co., Montreal.

EXHAUSTERS

Can. Blower & Forge Co., Kitchener, Ont.
Pangborn Corporation, Hagerstown, Md.
Williams & Wilson, Ltd., Montreal, Que.

EXTRACTORS, TAP

Walton Co., The, Hartford, Conn.

EYE BOLTS AND NUTS

Can. Foundries & Forgings, Ltd., Welland, Ont.

EYE PROTECTORS

Standard Optical Co., Geneva, N.Y.
Strong, Kennard & Nutt Co., Cleveland.
Willson & Co., Inc., T. A., Reading, Pa.

FACTORY GATES

Page Steel & Wire Co., Adrian, Mich.

FANS

Baird Machine Co., Bridgeport, Conn.
Can. Blower & Forge Co., Kitchener, Ont.

FENCING, WIRE

Page Steel & Wire Co., New York, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

FENCE, IRON AND FACTORY

Can. Wire & Iron Goods, Hamilton, Ont.
Page Steel & Wire Co., Adrian, Mich.

FERRO-TUNGSTEN

Vanadium-Alloys Steel Co., Pittsburgh, Pa

FILES

Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., Wm., Sheffield, Eng.
Ingersoll File Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Marshall, Son & Bunney, Toronto, Ont.
Nicholson File Co., Port Hope, Ont.
Rice Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Montreal.
Simonds Mfg. Co., Fitchburg, Mass.
Whitman & Barnes Mfg. Co., Akron, O.
Wilkinson & Kompass, Hamilton, Ont.

FILTERING AND CIRCULATING SYSTEMS FOR LUBRICATING OIL

Bowser & Co., S. F., Fort Wayne, Ind.
Can. Wire & Iron Goods, Hamilton, Ont.

FIRST AID CABINETS

Strong, Kennard & Nutt Co., Cleveland.

FIRE BRICKS

Harbison-Walker Refractories Co., of Canada, Montreal, Que.

FIRE EXTINGUISHERS

Strong, Kennard & Nutt Co., Cleveland, O.

FIXTURES

Brown Engineering Corp., Toronto, Ont.
Crescent Machine Co., Ltd., Montreal.
Elliott & Whitehall Mach. & Tool Co., Galt, Ont.
Illinois Tool Works, Chicago, Ill.
Marten Machine Co., Hamilton, Ontario.
Toronto Tool Co., Toronto, Ont.

FLEXIBLE SHAFT COILING MACHINERY

Sleeper & Hartley, Inc., Worcester, Mass.

FLAT SPRINGS

The Dunbar Brothers Co., Bristol, Conn.

FLANGING CLAMPS

Wickes Bros., Saginaw, Mich.

FORGES, HAND PORTABLE

Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Rice Lewis & Son, Toronto, Ont.

FORGINGS, STEEL AND IRON

Can. Found. & Forgings, Ltd., Welland.
Nova Scotia Steel & Coal Co., New Glasgow, N.S.

FORGINGS, DROP, AUTOMOBILE AND LOCOMOTIVE FORGING AND WELDING

Victoria Foundry Co., Ottawa.
Dominion Bridge Co., Montreal, Que.
Dom. Forge & Stamp'g Co., Walkerville.
Steel Co. of Canada, Ltd., St. Catharines.
Williams & Co., J. H., Brooklyn, N.Y.

FORGING MACHINERY

John Bertram & Sons Co., Dundas, Ont.
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machy. Co., Toronto, Ont.
National Machy. Co., Tiffin, Ohio.
Williams & Wilson, Ltd., Montreal, Que.

FORGINGS, SPECIAL

Armstrong-Whitworth of Can., Montreal.
Can. Found. & Forgings, Ltd., Welland.
Williams & Co., J. H., Brooklyn, N.Y.

FORMING

H. Hope & Sons of Can., Ltd., Peterboro

FOUNTAINS, DRINKING

Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

FRICTION LEATHERS

Graton & Knight Mfg. Co., Montreal.

FRICTION SURFACE BELTING

Can. Consolidated Rubber Co., Montreal.

FUEL OIL SYSTEMS

Bowser & Co., S. F., Inc., Fort Wayne.
Gilbert & Barker Mfg. Co., Springfield.

FURNACES, ANNEALING, CASE HARDENING AND TEMPERING

Bellevue Furnace Co., Detroit, Mich.
Chicago Flexible Shaft Co., Chicago, Ill.
Gilbert & Barker Mfg. Co., Springfield.
Mechanical Eng'r'g Co., Three Rivers, Q.
Standard Fuel Engr. Co., Detroit, Mich.
Williams & Wilson, Ltd., Montreal, Que.

FURNACES, BLAST

Bellevue Industrial Furnace Co., Detroit.
Toronto Iron Works, Ltd., Toronto.

FURNACES, FORGING

Gilbert & Barker Mfg. Co., Springfield.
Standard Fuel Engr. Co., Detroit, Mich.

FURNACES, HIGH SPEED STEEL,

Standard Fuel Engr. Co., Detroit, Mich.

FURNACES, LEAD AND SALT

Standard Fuel Engr. Co., Detroit, Mich.

FURNACES, RIVETING

Standard Fuel Engr. Co., Detroit, Mich.

FUSE BOXES, STEEL

Dom. Forge & Stamp. Co., Walkerville.

GANG PLANER TOOLS

Armstrong Bros. Tool Co., Chicago.

GASKETS, LEATHER, ETC.

Graton & Knight Mfg. Co., Montreal.

GASOLINE METERS

Bowser & Co., S. F., Inc., Fort Wayne.

GASOLINE TANKS

Bowser & Co., S. F., Inc., Fort Wayne.

GASOLINE PUMPS, SELF-MEASURING

Bowser & Co., S. F., Inc., Fort Wayne.

GAUGES

Elliott & Whitehall Mach. & Tool Co., Galt, Ont.

GAUGERS, CALIPERS

Williams & Co., J. H., Brooklyn, N.Y.

GAUGES, MERCURY COLUMN, DRAFT

Taylor Instrument Co., Rochester, N.Y.

GAUGES, HYDRAULIC

Taylor Instrument Co., Rochester, N.Y.

GAUGES, MANUFACTURERS, LIMIT, THREAD

Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Can., Galt, Ont.

GAUGES, STANDARD

Brown Engineering Corp., Toronto, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Garvin Machine Co., New York.
Illinois Tool Works, Chicago, Ill.
C. E. Johanson, Inc., Toronto, Ont.
Morse Twist Drill & Machine Co., New Bedford.
Peck, Stow & Wilcox Co., Southington, Conn.
Pratt & Whitney Co., Hartford, Conn.
Taylor, J. A. M., 318 Stair Bldg., Toronto
Toronto Tool Works, Toronto, Ont.
Wells Brothers Co. of Canada, Galt, Ont.
Worth Engineering Co., Toronto, Ont.

GAUGES, THREAD

Bicknell-Thomas Co., Greenfield, Mass.

GAUGES, VACUUM AND PRESSURE

Bristol Co., Waterbury, Conn.
Taylor Instrument Co., Rochester, N.Y.

GAUGES, SNAP, THREAD AND CYLINDRICAL

C. E. Johanson, Inc., Toronto, Ont.

GEAR BLANKS

Can. Steel Foundries, Ltd., Montreal.
Dom. Found. & Steel, Hamilton, Ont.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.
Wilson & Co., J. C., Belleville, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

GEAR BLANKS, CAST

Katie Foundry, Galt, Ont.

GEAR SHAPERS AND CUTTERS

Fellows Gear & Shaper Co., Springfield, V.

GEAR-CUTTING MACHINERY

Bilton Mach. Tool Co., Bridgeport, Conn.
Fellows Gear & Shaper Co., Springfield, V.
Garlock-Walker Mchy. Co., Toronto, Ont.
D. E. Whiton Machine Co., New London, Conn.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

GEAR-TESTING MACHINE

Gisholt Machine Co., Madison, Wis.

GEAR-TURNING MACHINES, BEVEL

Bridgeford Mach. Tool Wks, Rochester.

GEAR BOXES, REDUCTION

Coventry Chain Co., Coventry, Eng.

GEARS, CHAIN

Morse Chain Co., Ithaca, New York.

GEARS, COMPENSATING

Morse Chain Co., Ithaca, New York.

GEARS, CUT, MORTISE, ANGLE, WORM

Baxter & Co., Ltd., J. R., Montreal.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Gardner, Robt., & Son, Montreal.
Grant Gear Works, Boston, Mass.
Hamilton Gear & Machine Co., Toronto.
Hull Iron & Steel Found., Ltd., Hull, Q.
Illinois Tool Works, Chicago, Ill.
Jones & Glassco, Montreal.
Wm. Kennedy & Sons, Ltd., Owen Sound, Ont.
Philadelphia Gear Works, Philadelphia
Victoria Foundry Co., Ottawa.
Wilson & Co., J. C., Belleville, Ont.

GEARS, RAWHIDE

Gardner, Robt., & Son, Montreal.
Grant Gear Works, Boston, Mass.
Hamilton Gear & Machine Co., Toronto
Jones & Glassco, Montreal.
Philadelphia Gear Works, Philadelphia.
A. R. Williams Machy. Co., Toronto.

GENERATORS, GEAR

Fellows Gear & Shaper Co., Springfield, V.

GEARS, SPRING

Morse Chain Co., Ithaca, New York.

GEARS, SILENT CHAIN GENERATORS, STEAM TURBO

Can. General Electric Co., Toronto, Ont.

GENERATORS AND CONVERTORS

Can. General Electric Co., Toronto, Ont.

GENERATORS, MOTOR

A. R. Williams Machry. Co., Toronto.
Williams & Wilson, Ltd., Montreal.
MacGovern & Co., Montreal.

GERMAN SILVER

Brown's Copper & Brass Rolling Mills, New Toronto, Ont.

GLOVES, ASBESTOS, ACID PROOF, WATERPROOF, ETC.

Strong, Kennard & Nutt Co., Cleveland.

GLUE HEATERS

Oliver Machinery Co., Grand Rapids, Mich

GLASSES, SAFETY

Strong, Kennard & Nutt Co., Cleveland.
Willson & Co., Inc., T. A., Reading, Pa.

GOVERNOR, WATER WHEEL

Wilson & Co., J. C., Belleville, Ont.

GRAPHITE

Aikenhead Hardware, Ltd., Toronto.
Rice Lewis & Son, Toronto.

GOGGLES

Consolidated Optical Co., Toronto.
Standard Optical Co., Geneva, N.Y.
Strong, Kennard & Nutt Co., Cleveland.
Willson & Co., Inc., T. A., Reading, Pa.
Welding & Supplies Co., Montreal.

GRAVITY CARRIERS

Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.

GREASE CUPS, PRESSED STEEL, BRASS

Can. Winkley Co., Ltd., Windsor, Ont.

GREASES (See Lubricants)

GRINDERS, AUTOMATIC KNIFE

W. H. Banfield & Son, Toronto.
Canada Machinery Corp., Galt, Ont.
Foss Mchry. & S'ply Co., G. F., Montreal
Garlock-Walker Machinery Co., Toronto.

GRINDERS, CENTRE COLUMN, PEDESTAL AND BENCH

Wisconsin Electric Co., Inc., Racine, Wis.
Blake & Johnson Co., Waterbury, Conn.
Can. Machinery Corp., Galt, Ont.
Cleveland Pneumatic Tool Co., Toronto.
Ford-Smith Mach. Co., Hamilton, Ont.
Foss Mchy. & S'ply. Co., G. F., Montreal.
Garlock-Walker Machinery Co., Toronto.
Katie Foundry, Galt, Ont.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Machine Co., New Bedford.
Niles-Bement-Pond Co., New York, N.Y.
Perfect Machine Co., Galt, Ont.
United States Elec. Tool Co., Cincinnati.
Williams & Wilson, Limited, Montreal.

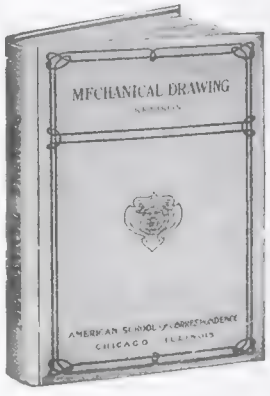
GRINDERS, CUTTER

Brown & Sharpe Mfg. Co., Providence, R.I
Cincinnati Milling Mach. Co., Cincinnati.
Foss Mchy. & S'ply. Co., G. F., Montreal.
Garvin Machine Co., New York.
Greenfield Machine Co., Greenfield, Mass.
Greenfield Tap & Die Corp., Greenfield, M.
Heald Machine Co., Worcester, Mass.

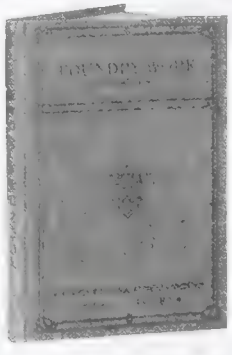
Mechanical Engineering Books

If you are desirous of improving yourself in your trade and so putting yourself in the position of making more money, these Mechanical Engineering Books will be found helpful.

MACHINE-SHOP WORK. By Frederick W. Turner, Instructor in Machine-Shop Work, Mechanics Arts High School, Boston. 208 pp., 241 illus. Cloth binding. The use of various hand tools is explained, followed by a comprehensive discussion of the lathe and lathe tools, with the methods of screw cutting, taper and eccentric turning, etc. The way to figure compound gears for screw cutting; drilling; boring; planers; shapers; slotters; milling machines and cutters; how to cut spirals, gears, cams, etc.; grinding; the operation of automatic machines. Price $2.00



MECHANICAL DRAWING. By Ervin Kenison, S.B., Assistant Professor of Mechanical Drawing, Massachusetts Institute of Technology. 176 pp., 120 illus. Cloth binding. Gives a course of practical instruction in the art of Mechanical Drawing, based on methods that have stood the test of years of experience. Includes orthographic, isometric and oblique projections, shade lines, intersections and developments, lettering, etc., with abundant exercises and plates. Price $1.25



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Garvin Machine Co., New York
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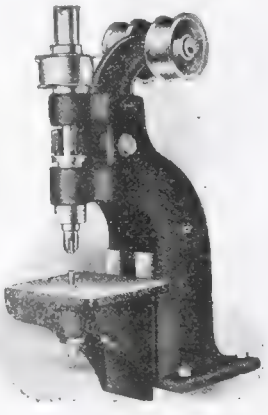

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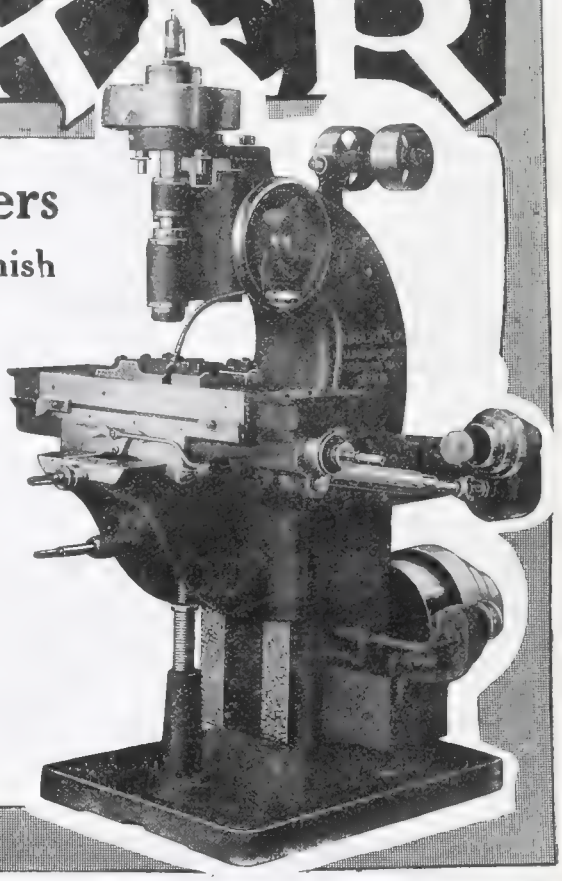

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Kayser-Ellison & Co., Ltd., Montreal.
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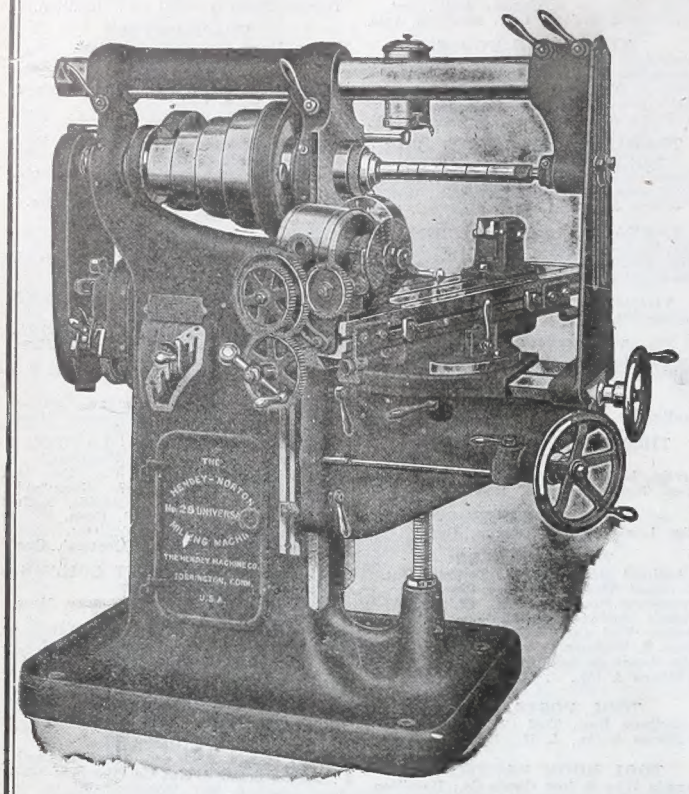

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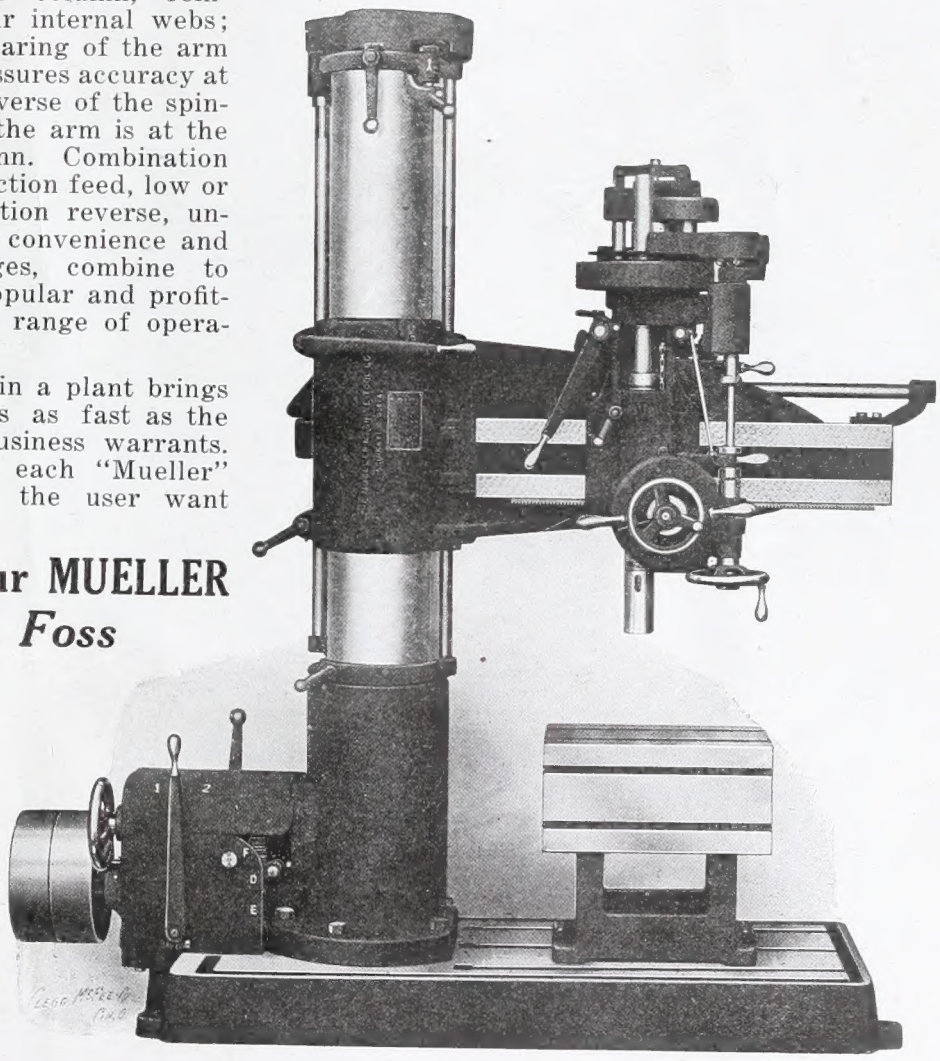

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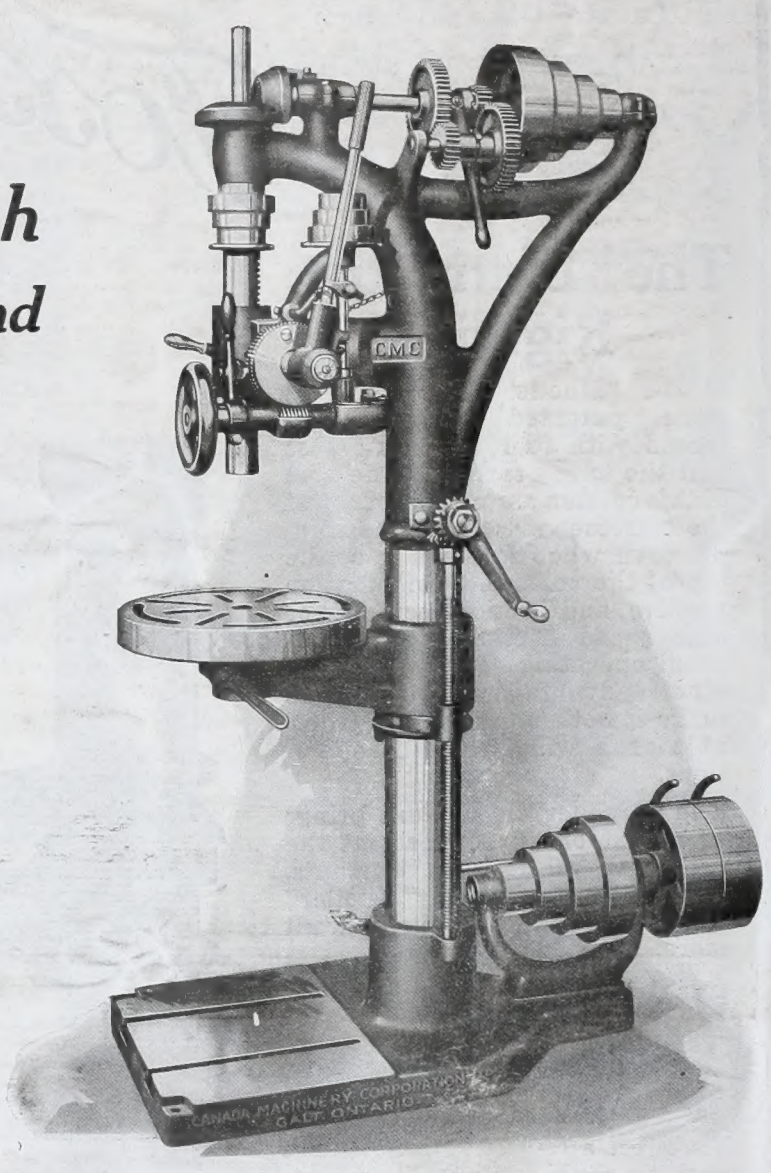

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